

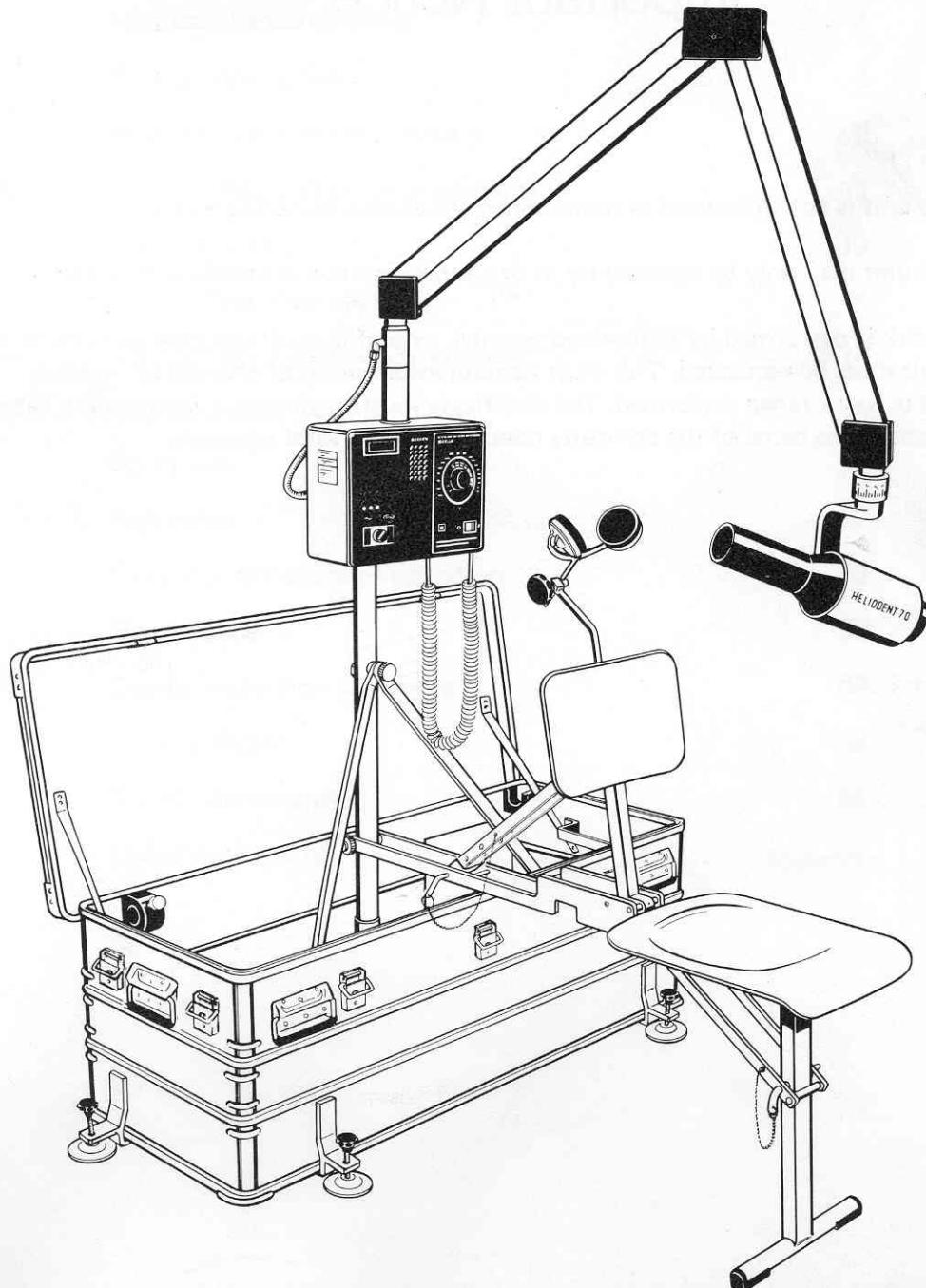
**SIEMENS**

**PORTARAY**  
**HELIODENT® 70**

**with DENTOTIME**

**Model D3152 50/60 HZ Operation**

**Maintenance Instructions**



## Important Notice

This unit is not to be used in rooms where an explosion hazard exists.

This unit may only be repaired by us or a representative expressly authorized by us.

If work is performed by authorized persons, a certificate on the type and extent of repair must be requested. This must contain information of changes of nominal data or work range performed. The certificate must furthermore indicate the date of repair, the name of the company concerned and a valid signature.

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## Description of the equipment

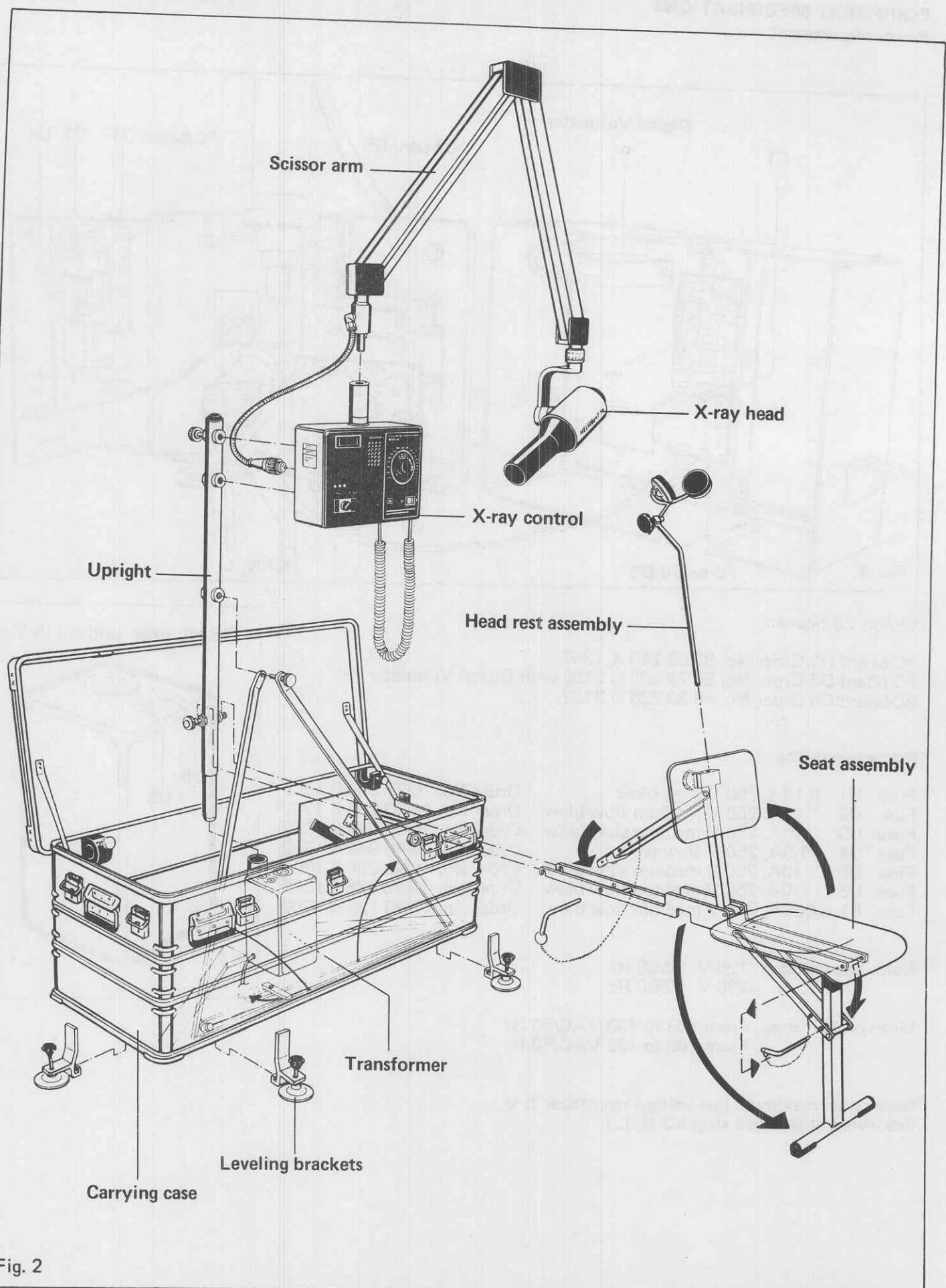
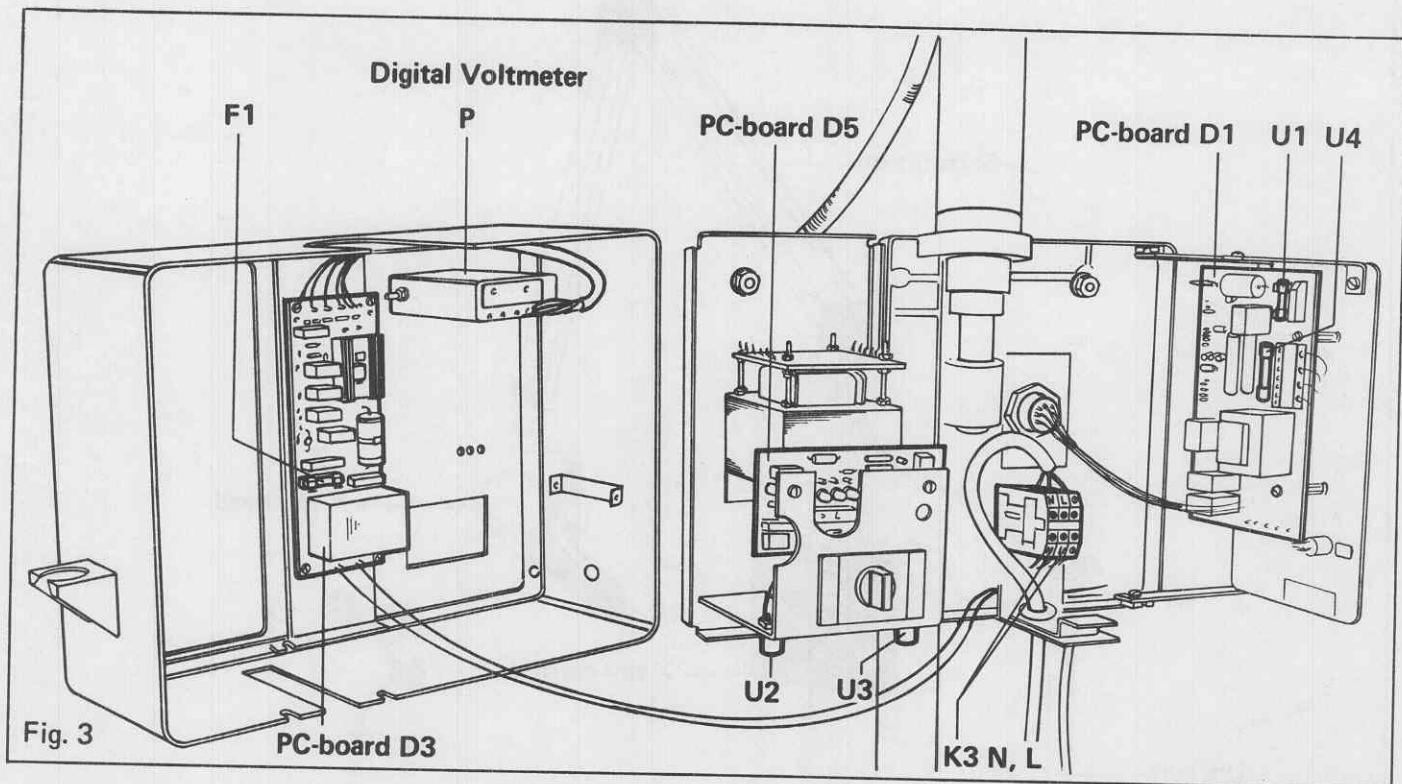


Fig. 2

## EQUIPMENT SPECIFICATIONS

### Power requirement



### Circuit PC boards:

PC-board D1 Order No. 83 53 245 X 1357

PC-board D3 Order No. 58 75 802 D 3152 with Digital-Voltmeter "P"

PC-board D5 Order No. 58 83 236 D 3152

### Protective device:

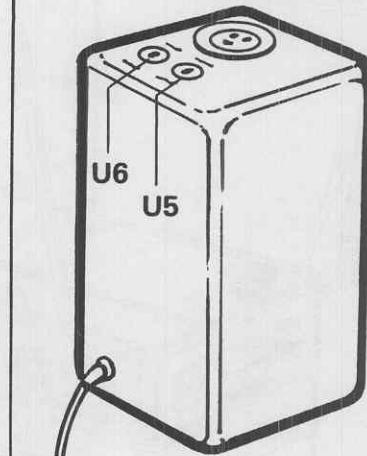
Fuse U1	0,16A, 250 V slow blow	Order No. 10 77 379 B 1302
Fuse U2	10A, 250 V medium slow blow	Order No. 10 20 288 B 1302
Fuse U3	10A, 250 V medium slow blow	Order No. 10 20 288 B 1302
Fuse U4	1,5A, 250 V slow blow	Order No. 10 40 948 B 1302
Fuse U5	10A, 250 V medium slow blow	Order No. 10 20 288 B 1302
Fuse U6	10A, 250 V medium slow blow	Order No. 10 20 288 B 1302
Fuse F1	0,063A, 250 V medium slow blow	Order No. 10 90 133 B 1302

Nom. line voltage    125 V 50/60 Hz  
                      or    230 V 50/60 Hz

Line voltage range: From 109 to 133 VAC/60 Hz  
                      From 109 to 132 VAC/50 Hz

Permissible maximum line voltage regulation 6 V  
(measured at terminal strip K3 N, L.)

### Transformer outlet 115 V



## PHYSICAL DESCRIPTION

### X-ray control:

Weight: 15,4 Lbs. (7 kg)

Consists of:

- Base plate,
- Line compensation transformer T3 with instrument circuit PCboard D5.
- Power supply PC board D3 and digital instrument P.
- Object/exposure time assembly with PC board D1.

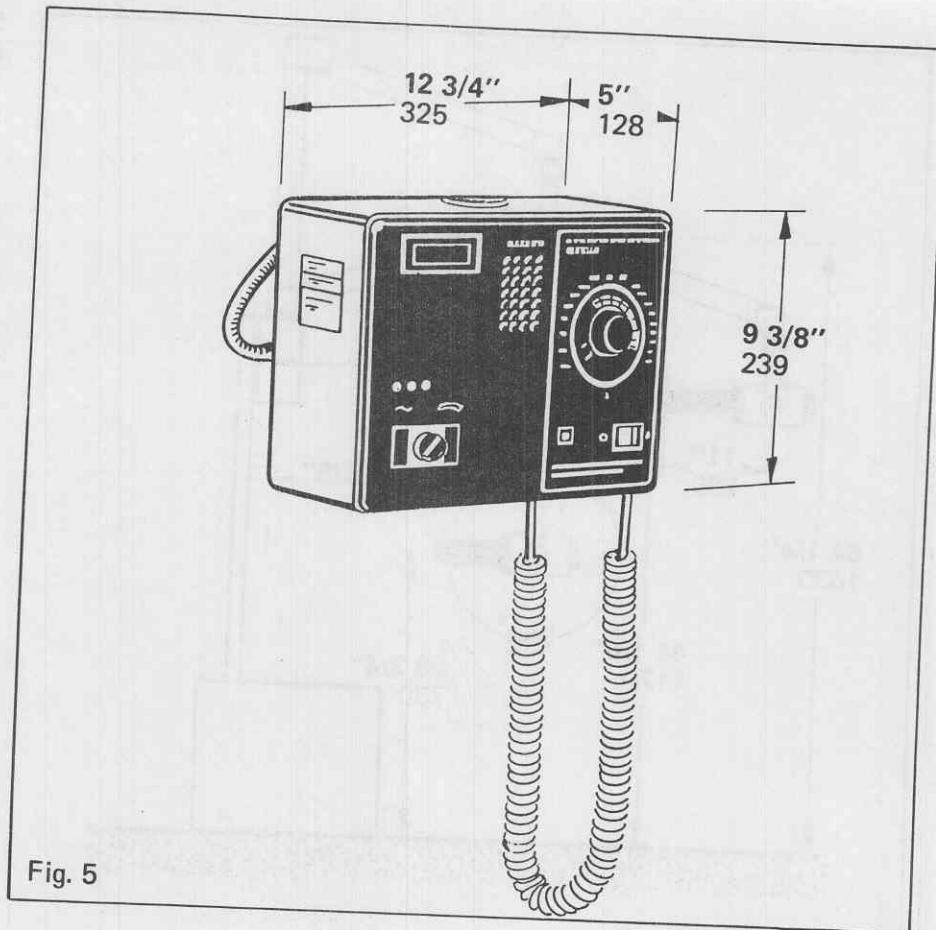


Fig. 5

### X-ray head:

Weight: 11 Lbs. (5 kg)

Consists of:

- High tension transformer H1.
- High voltage capacitor C1.
- Voltage doubling circuit V10.
- X-ray tube.
- Oil filled aluminum housing for insulation and cooling of the above components.
- Lead shielded collimator.

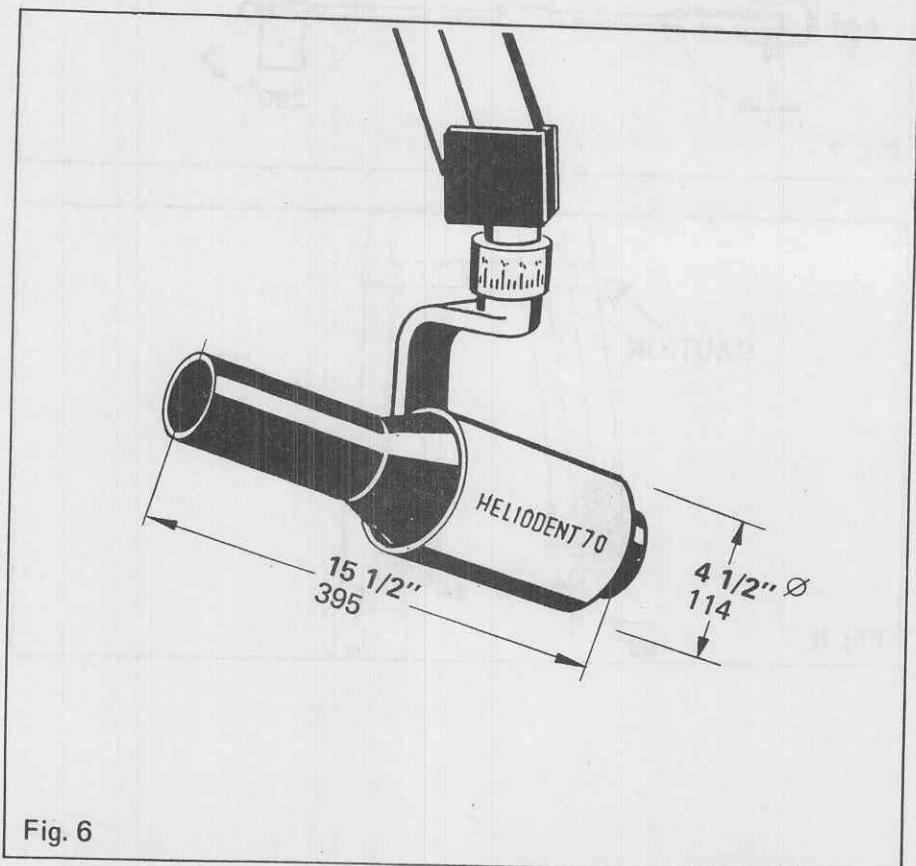


Fig. 6

**Scissor arm:**

Spring loaded scissor to support the X-ray head in a drift-free condition over an operating range as shown in the dimensional drawing.

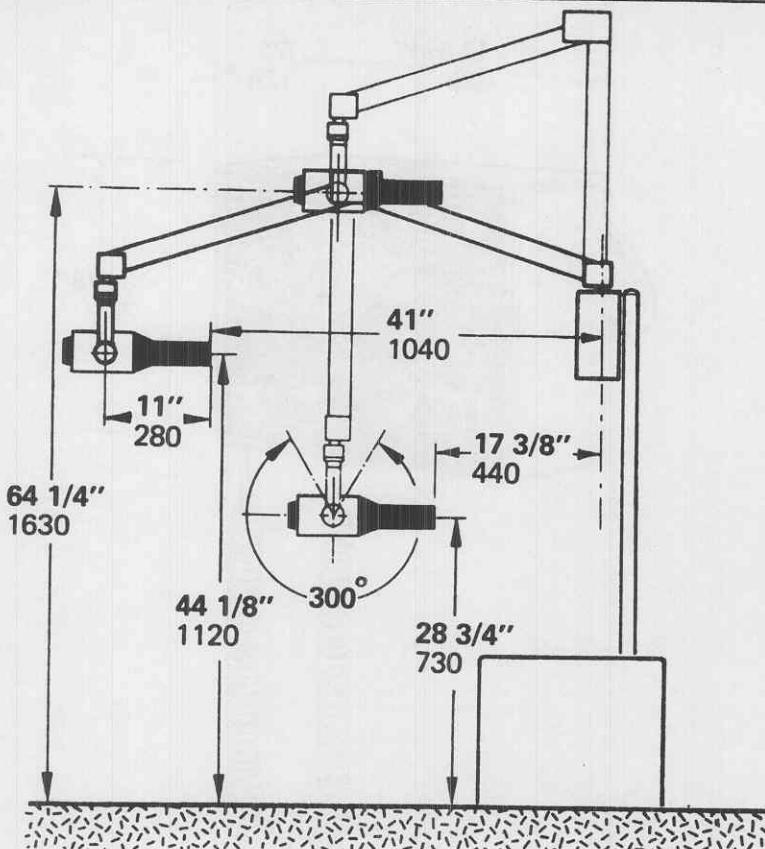


Fig. 7

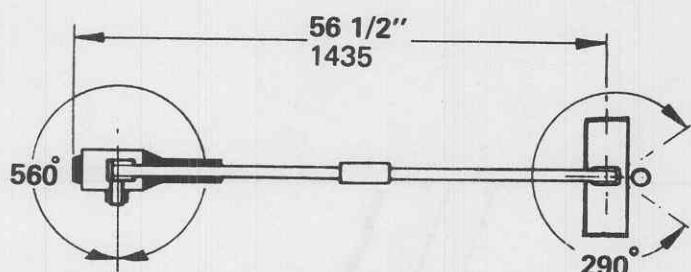
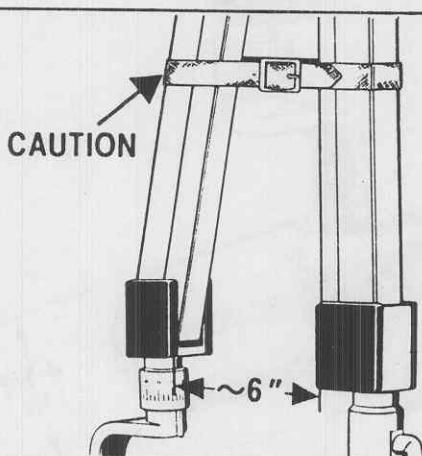


Fig. 8



**Caution:**

Removal of the X-ray head requires securing the scissor arm in a semi opened position to prevent accidental opening (spring loaded).

A five conductor wiring harness connects the X-ray head to the X-ray control.

**Patient seat assembly:**  
Weight: 30,8 Lbs. (14 kg)

Metal constructions with pressure treated seat and backrest.

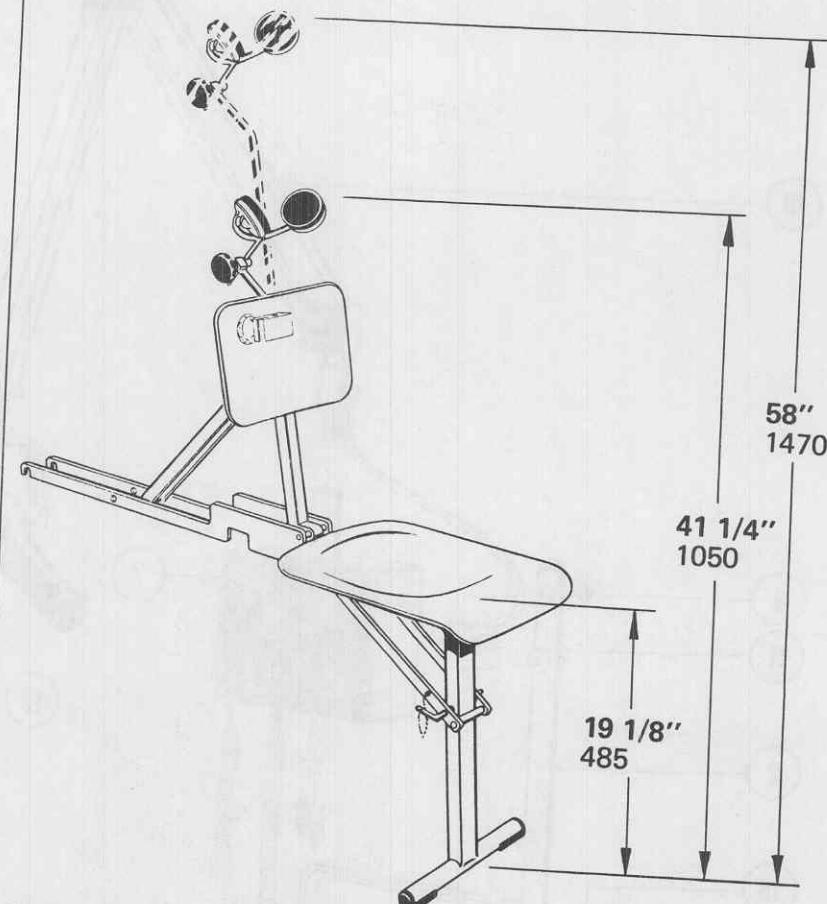


Fig. 9

#### Carrying case:

Weight with mounting devices and support structure: 92,5 Lbs. (42 kg)

Aluminum case finished with aliphatic polyurethane, chemical agent resistant paint, color forest green, with 6 carrying handles. The case lid is secured with 10 lockable latches.

The case is waterproof and fitted with an overpressure valve.

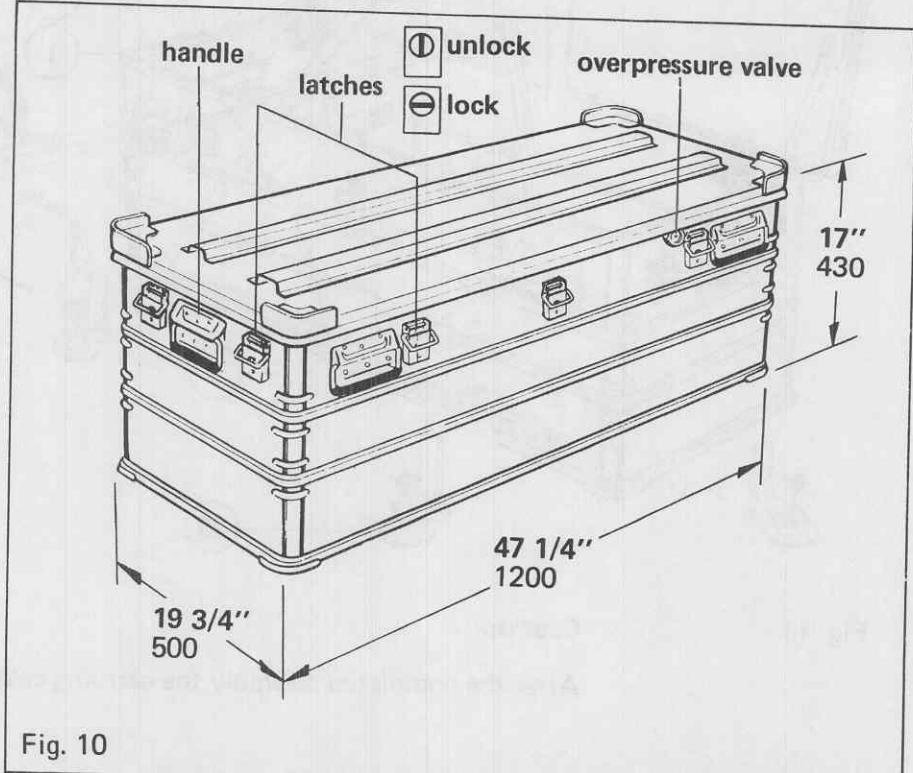


Fig. 10

## ASSEMBLY INSTRUCTIONS FOR PORTARAY - MODEL D 3152

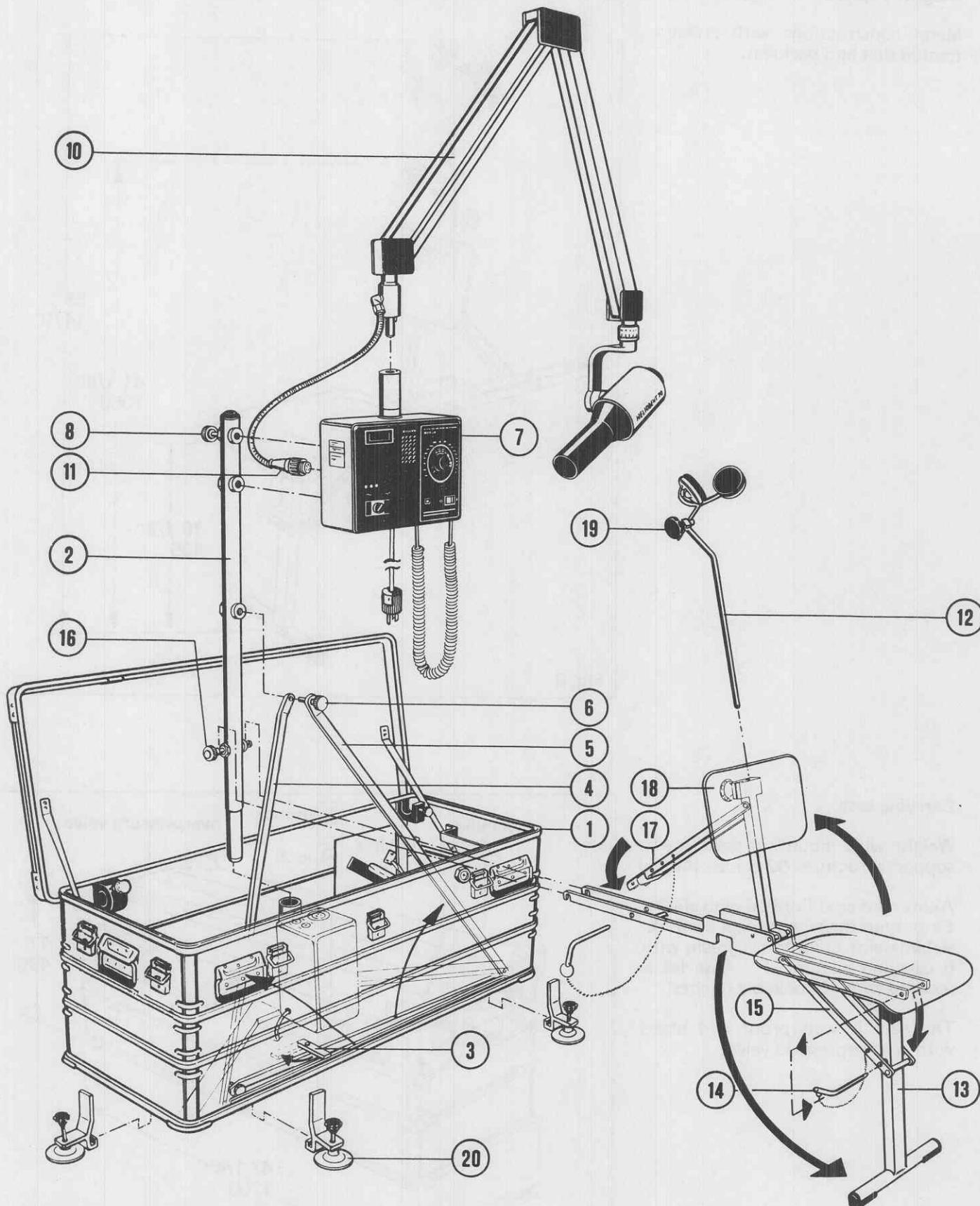


Fig. 11

### Caution:

After the completed assembly the carrying case must be leveled.

## Set-up

### 1

Remove all components from carrying case (1).

Lay out components keeping numbers in sequence.

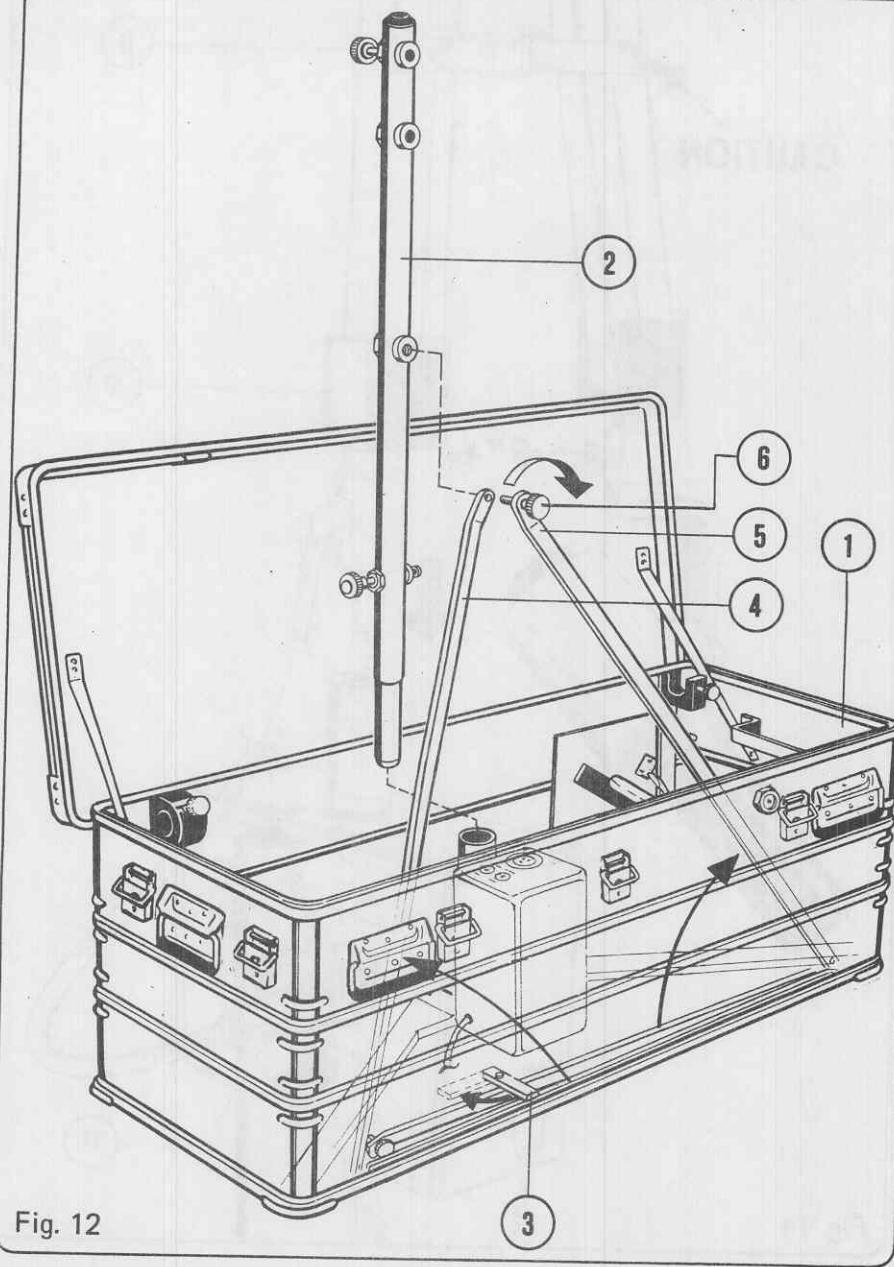


Fig. 12

Insert upright (2) into base, swing bracket (3) in the direction of the arrow.

Lift support bars (4) and (5), secure same in upright as shown with knob (6).

### 2

Engage dowel pins of X-Ray control adapter (7) in upright, secure with knob (8).

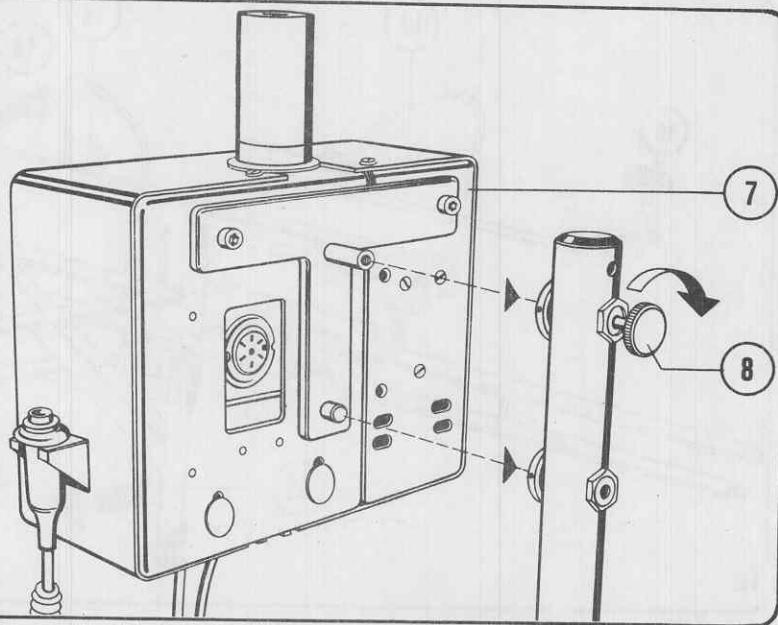


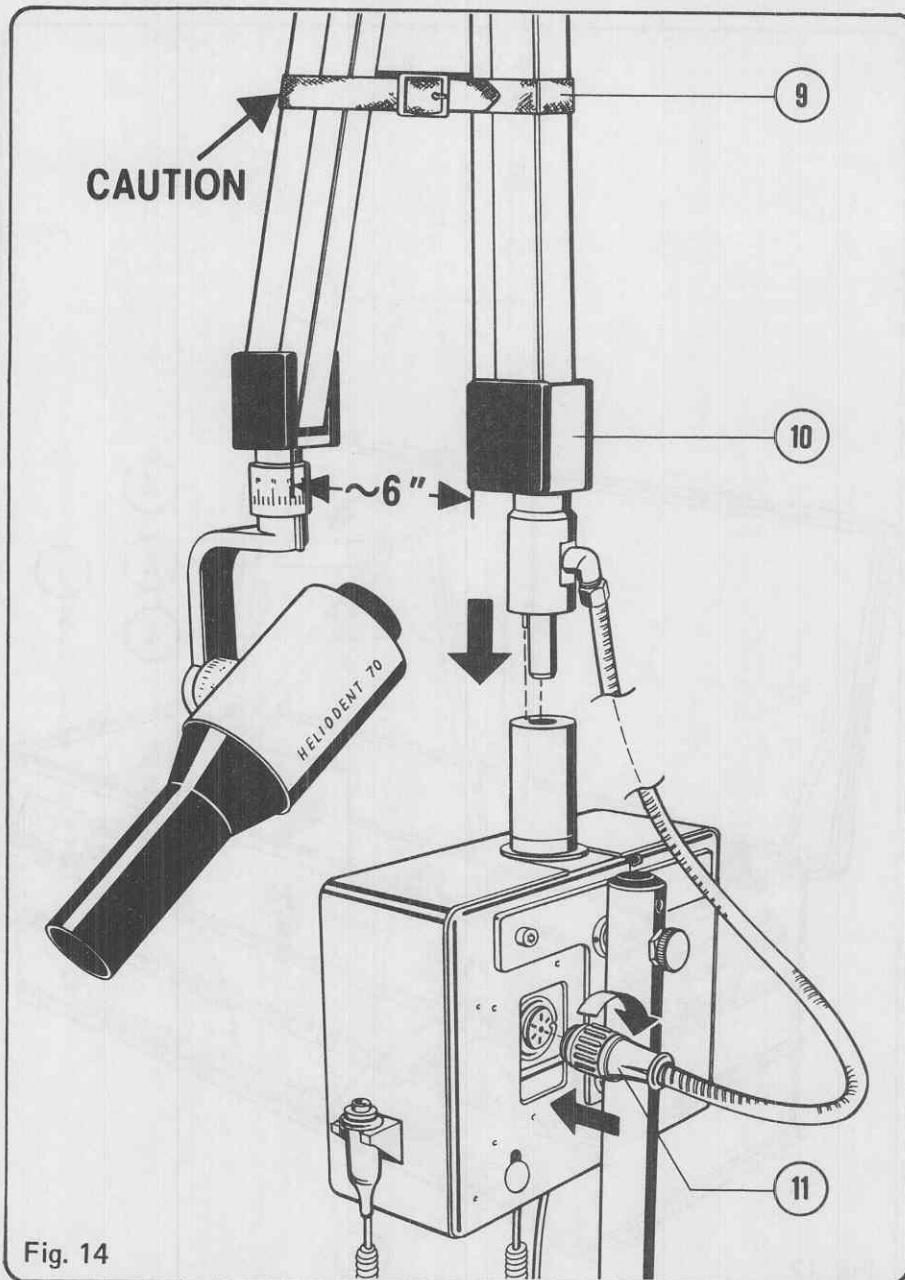
Fig. 13

### 3

Loosen safety strap (9) to permit a 6" opening of the scissor arm (10) before engaging the arm in the coupling as shown.

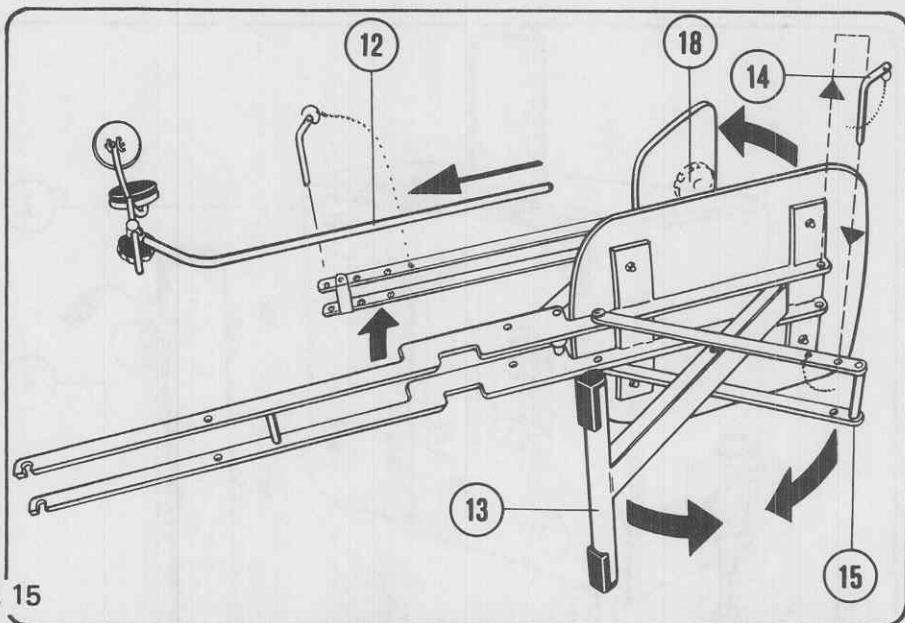
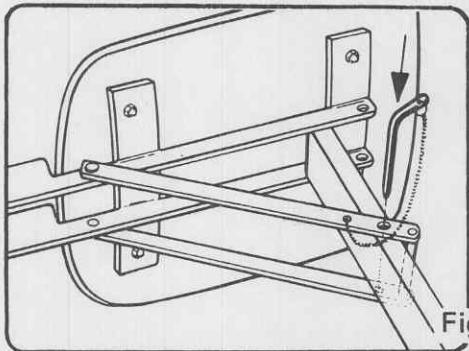
**CAUTION!** To prevent accidental opening of the spring loaded scissor arm, causing injury and arm damage. DO NOT REMOVE safety strap completely, unless the arm is fully engaged in the coupling.

Connect multi pin plug (11) secure with lock ring in direction of arrow.



### 4

Loosen knob (18), remove headrest assembly (12) from storage position. Remove safety pin (14). Unfold stool leg (13) and retainer bracket (15). With stool leg fully extended secure same with safety pin as shown see detail.



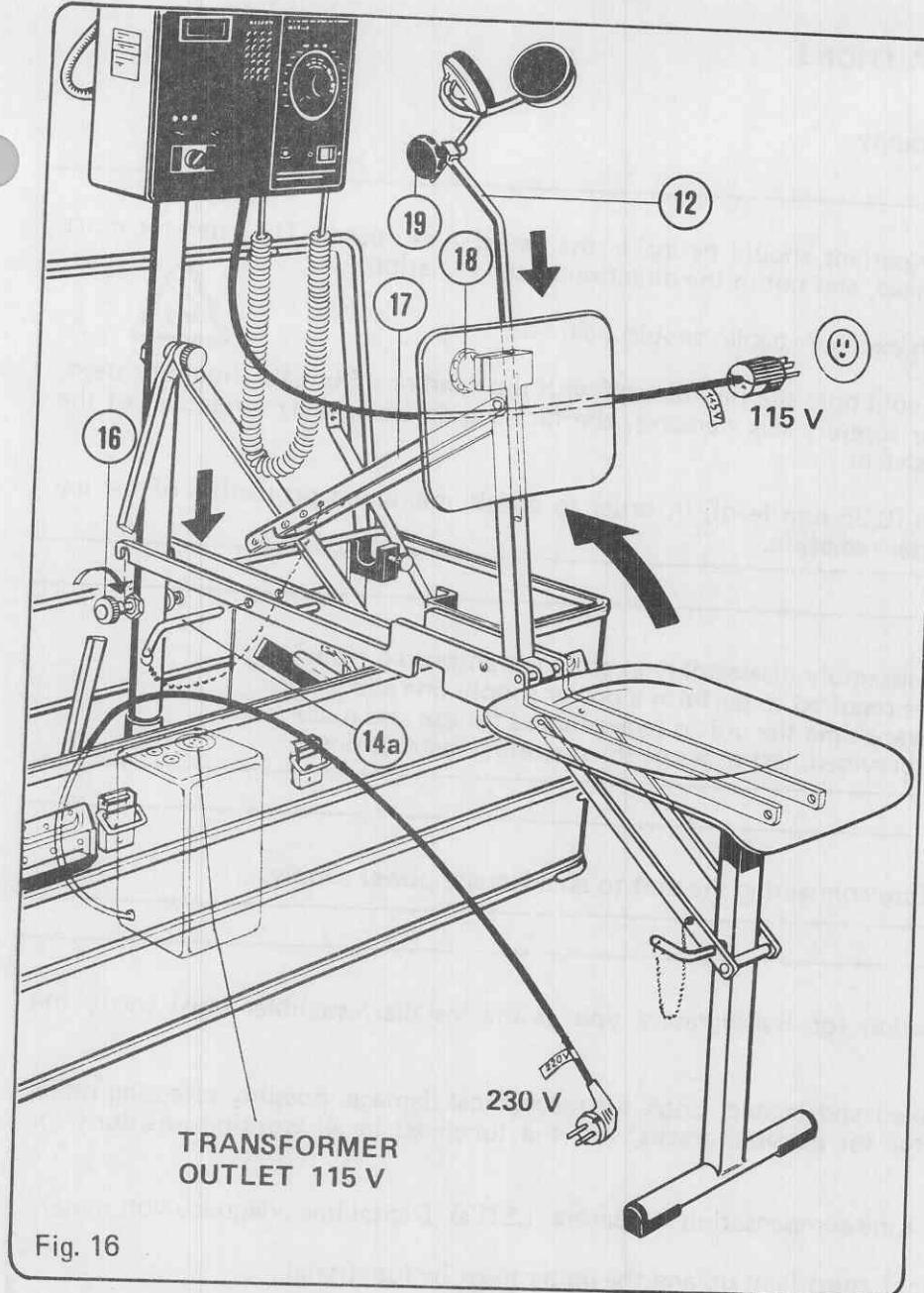


Fig. 16

## 5

Engage stool support in upright, secure with knob (16). Raise backrest in direction of arrow.

Position backrest with backrest brace (17) (3 positions) and secure with safety pin (14a).

Insert headrest assembly (12), secure with knob (18) (headrest height adjustment).

Adjust headrest cradle position with knob (19).

**When the power supply is 115 V:**  
Connect the power cord directly into the 115 V wall outlet.

**When the power supply is 230 V:**  
Connect the power cord at the transformer's 115 V outlet and connect the transformer's power cord into the 230 V wall outlet.

In case of a portable gasoline-diesel driven generator this generator must meet the following technical characteristics:

Power rating: 5 kVA,

Volts: 230 V nominal, single phase

Max.permissible deviation: 207 to

253 VAC

Max. permissible fluctuation of line voltage during standby:  
1.5 % at 230 VAC.

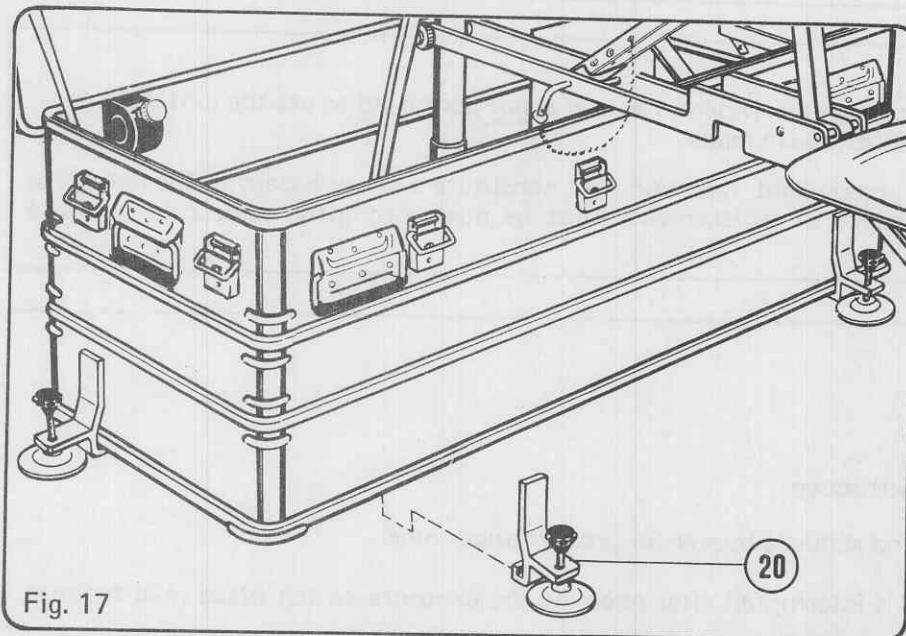


Fig. 17

## 6

Level carrying case and upright with the aid of 3-leveling brackets (20).

The leveling brackets hook to the lower carrying case frame.

## PATIENT SAFETY AND OTHER PRECAUTIONS

### Radiation protection for intraoral radiography

#### WARNING

During the exposure, nobody but the patient should be inside the useful X-ray beam. The operator must be at least 6 feet away from the X-ray head, and not in the direction of the radiation.



Full use of the length of the handswitch exposure cable should be made.

For dental radiography, the patient should hold the film himself with the hand or a film clip should be used. If this is not possible (with children or severely sick persons), the film should be held by a relative of the patient but not by the dentist or his assistant.

We recommend, the use of lead apron (0,25 mm lead), in order to obtain maximum protection of the patient's reproductive organs against scatter radiation.

#### WARNING

Since the Portable X-ray unit requires assembly-disassembly as same is transported from location to location, you the USER are required to perform a power supply line adequacy test as outlined in these instructions **every time** the unit is re-assembled for **use** and document same on the TEST RECORD as provided, last pages of the operating instructions.

#### WARNING

Visual checks must be performed before connecting the unit to an adequate power supply.

#### WARNING

When the unit is set-up in preparation for Radiography you as the installer/assembler **must** verify the following:

1. Verify that all labels are affixed and legible. Look for mechanical damage, possibly affecting radiation safety, (inspect collimator for possible cracks, test the tubehead in all working positions for possible drift).
2. Operating-ready light (green). Line compensation indicators (LED's). Digital line adequacy volt meter.  
The operating-ready light (green) must light up and the meter must be functional.

#### WARNING

Mechanical damage affecting radiation safety be evident, the user is not permitted to use the unit until repairs or replacements, correcting the defect(s), are made.

Defective bulbs for power "on" light, ready light, radiation light constitute a safety hazard to the patient as well as to the operator, therefore, repairs or replacements **must** be made promptly, same rule as above applies.

During line adequacy tests:

#### WARNING

Observe radiation protection as outlined above

1. Check radiation warning light and acoustic buzzer for proper functioning.
2. Make sure the X-ray exposure is interrupted after releasing the exposure switch (dead man feature).

## EQUIPMENT CARE

All equipment surfaces shall be wiped with a damp lintfree cloth once a week.

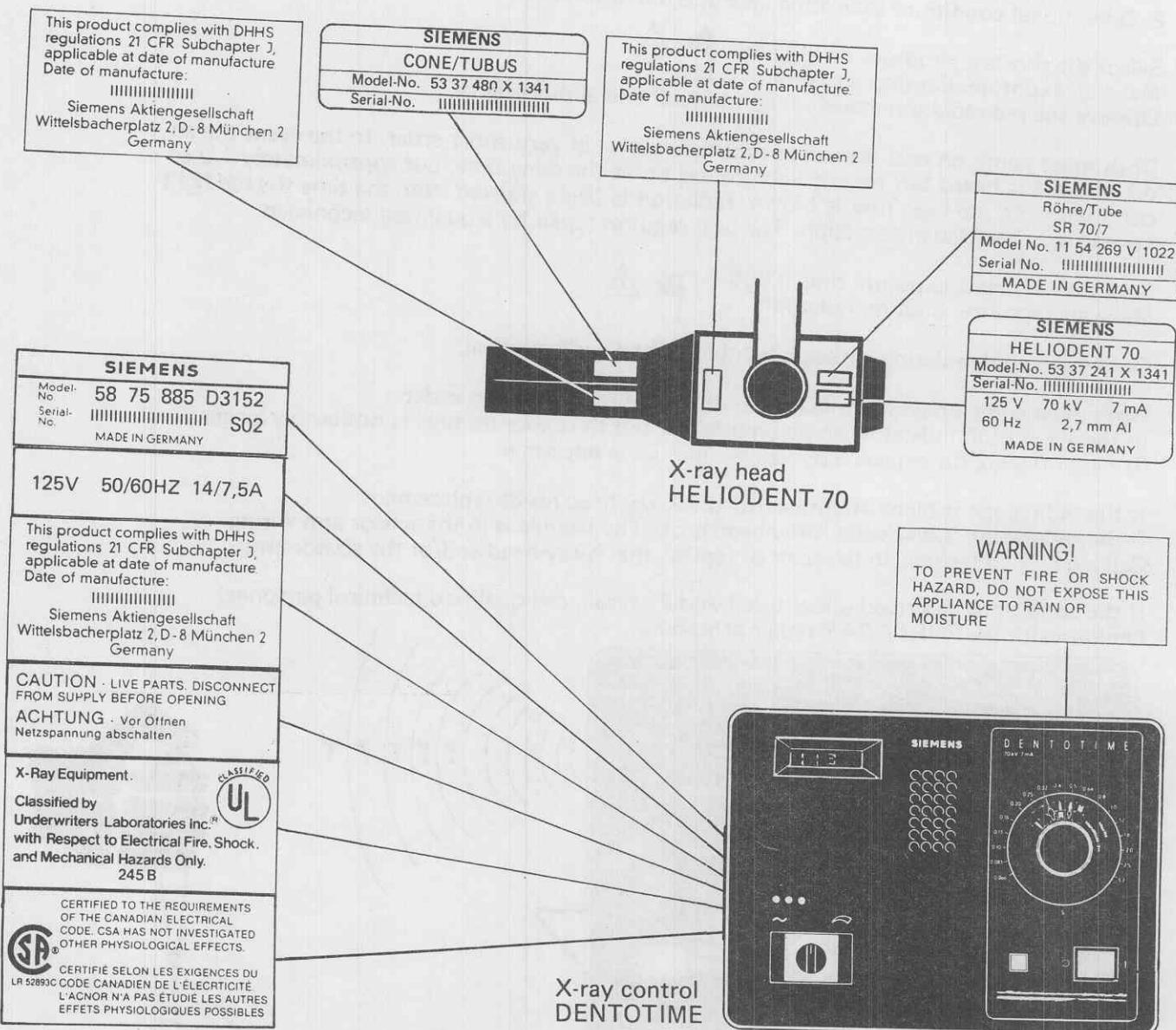
**Visual checks and tests before the unit is operated:**

1. Verify that all labels are affixed and legible. Look for mechanical damage, possibly affecting radiation safety.
2. Inspect components for tightness, rust, cracks, wear, fraying electrical cords, missing parts and operators publication.
3. Test tube head in all working positions for possible drift.
4. Operating-ready light (green). Line compensation indicators (LED's). Digital line adequacy volt meter.

The operating-ready light (green) must light up and the meter must be functional.

Should mechanical damage affecting radiation safety be evident, the user is not permitted to use the apparatus until repair or replacements, correcting the defects are made.

### How to find product labels



## ALERTS / TROUBLESHOOTING

The following operational tests are carried out with the PORTARAY in a ready to operate condition.

### 1. Testing of the deadman feature

The deadman feature permits the premature immediate termination of X-rays.

- Set the object/exposure time selector to 3.2 seconds.
- Cover the collimator with cover cap (leaded) No. 58 83 194 (Radiation protection).
- With the exposure button maintain a distance of at least 6FT from the X-ray head (Caution X-ray!) during exposure.
- Make an exposure. Count 5001 (fivethousandone) which equals approximately one second. Release the exposure button — the audible and visible radiation indicators must terminate immediately.
- In the event the radiation visible and audible indicators do not stop, disconnect the unit from the power supply immediately — call qualified service personnel familiar with the PORTARAY to repair this defect (exchange the DENTOTIME PC board D1 and adjust as indicated on page 43).

### 2. Operational conditions indicating improper timer function

Select the shortest exposure time 0.066.  

Make an exposure. Caution radiation.

Observe the red radiation emission light (visual) and audible signal.

Both must come on and terminate simultaneously in very short order. In the event the audible signal is heard but no red light comes on at the same time, but approximately 1/2 second later the pre-heat fuse is blown, radiation is being emitted from the time the red light comes on — insufficient emission. The unit requires repair by a qualified technician.

Select the shortest exposure time 0.066.  

Make an exposure. Caution radiation.

Observe the red radiation emission light(visual)and audible signal.

Both must come on and terminate simultaneously in very short order.

In the event both indicators come on together but the exposure time is noticeably longer (0.7 to 1.0 second), expose a periapical film. Develop same.

If the radiograph is blank (transparent) the X-ray head needs replacement.

If the radiograph is black the X-ray head is ok. The trouble is in the scissor arm wiring. Call a qualified technician to repair or replace the X-ray head and/or the scissor arm.

If the conditions described under test 1 and 2 prevail, call qualified technical personnel familiar with the PORTARAY repair procedure.

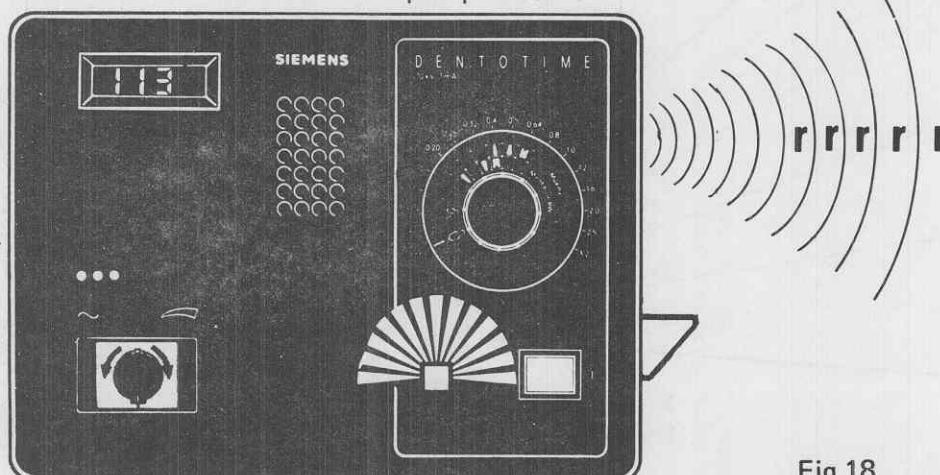
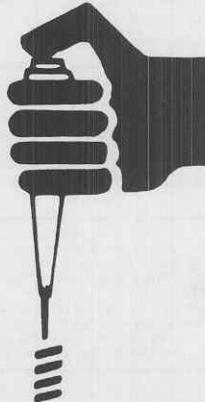


Fig.18



## ACCESSORIES

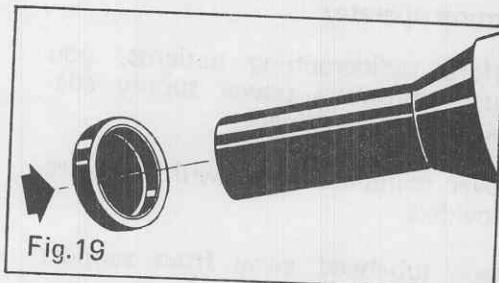


Fig.19

Lead cap provided for the line adequacy test.

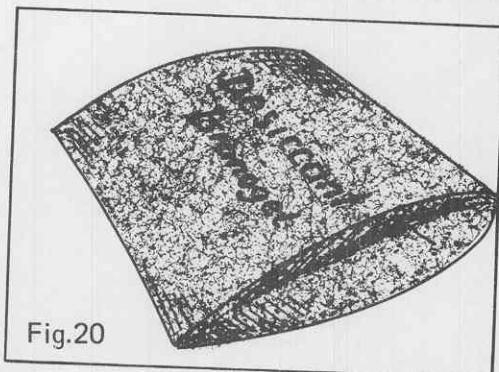


Fig.20

Desiccant bag to absorb moisture accumulated during storage.

## EQUIPMENT WARRANTY

Siemens dental equipment is warranted against defects in material and workmanship for a period of one year from the date of installation, provided all installation and subsequent service is performed by an authorized Siemens dental dealer or technician. Siemens' warranty is subject to the following conditions: (1) Siemens must receive prompt notice of any defect within the warranty period; (2) if equipment must be returned to Siemens for repair, transportation charges to the location designated by Siemens must be prepaid; (3) Siemens' examination must show that the defect occurred in the course of normal use and was not the result of misuse, abuse, accident or neglect. Subject to these conditions, Siemens will under its warranty repair or replace (at Siemens' option) any defective parts. Siemens' warranty extends only to the original purchase of the equipment and is not interrupted or prolonged by any repair or replacement provided pursuant to such warranty.

**SIEMENS MAKES NO WARRANTY OTHER THAN THE ONE SET FORTH ABOVE, SUCH WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THOSE OF FITNESS AND MERCHANTABILITY.**

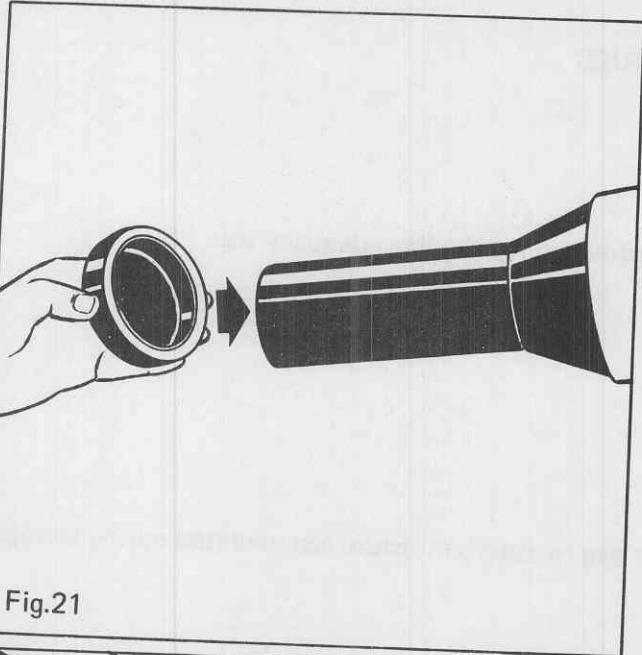


Fig.21

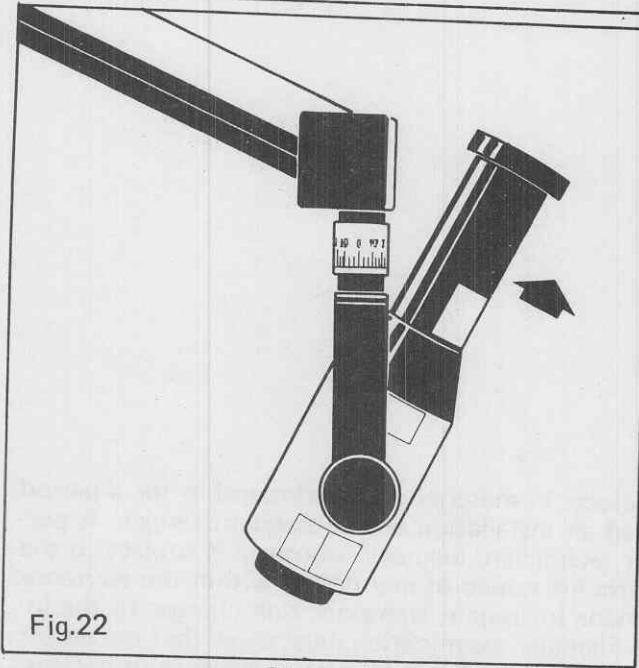


Fig.22

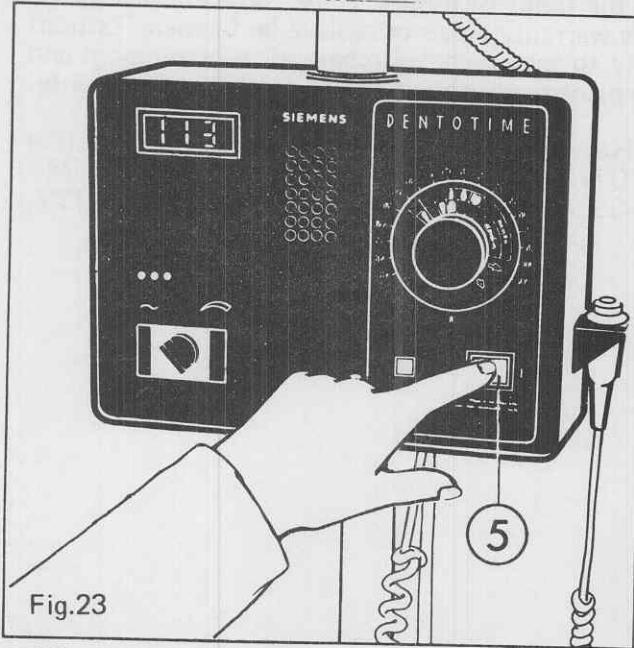


Fig.23

## LINE ADEQUACY TEST

### Attention operator

Before radiographing patients, you must perform a power supply adequacy test as outlined:

1. Cover collimator port with lead cap provided.
2. Place tubehead away from support stand (arm extended fully).
3. Plug in powercord (see set-up page 11).  
**WARNING**—power supply must be grounded.
4. Switch on X-ray control with switch (5)  
Power on — switch lights up (Green)

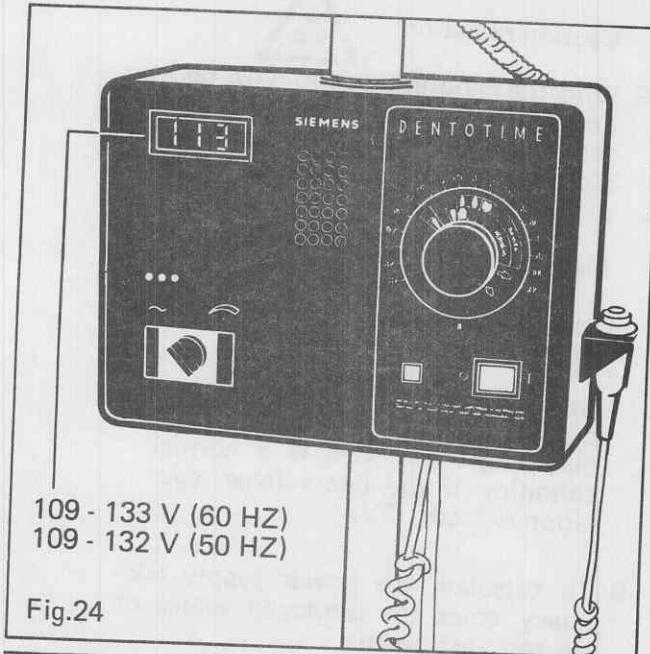


Fig.24

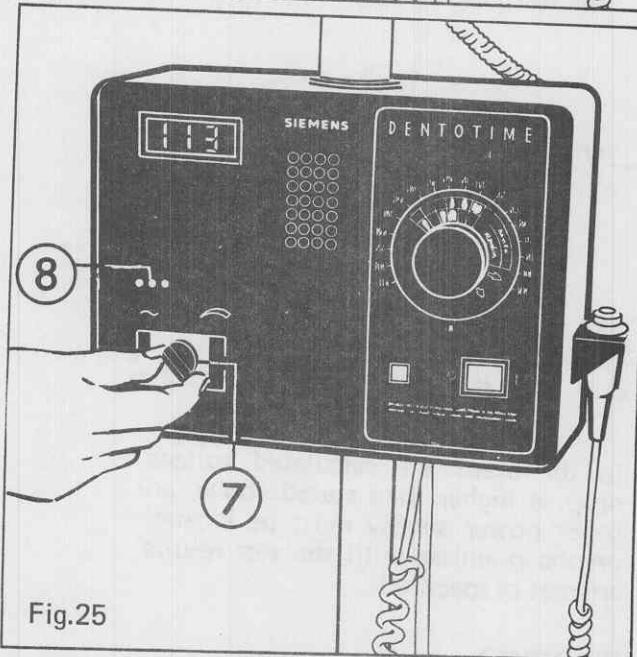


Fig.25

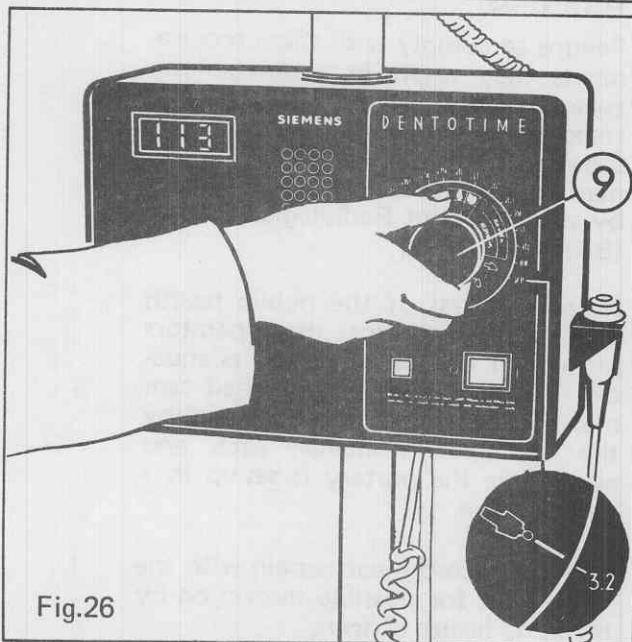


Fig.26

5. The digital power supply test instrument must read between:

min 109,0 V                          133,0 V max. at 60 HZ

min 109,0 V                          132,0 V max. at 50 HZ

After 5 minutes note value displayed on the test instrument, on test record (test records see Operating Instructions, appendix).

6. Verify that the green light diode (8) is lit:  

Yellow	Green	Red
(too low)	(O.K.)	(too High)

 Corrections are made with switch (7)

Yellow = Turn switch clockwise

Red = Turn switch counterclockwise

**CAUTION** — If green light will not come on, call medical maintenance personnel — DO NOT operate apparatus.

(See Maintenance page 41).

7. Select an exposure time of 3.2 seconds by turning knob (9) to align adult symbol (orange line) with 3.2 on scale.

Do not depress knob when aligning adult/child symbols.

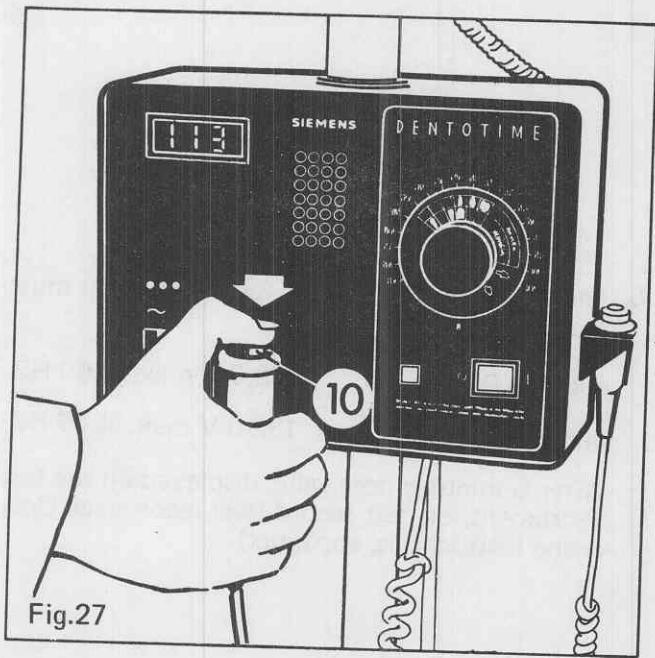


Fig.27

Value from step 5

                 V minus

No load

Step 8

                 V equals                  V

Load

Voltage drop

The maximum permissible voltage drop must not exceed  
6 V over the entire operating range.

In the event the calculated voltage drop is higher than stated above, another power supply must be located on the premises until the test results are met as specified.

#### WARNING

Failure to comply with these requirements may result in a non-compliance of "the federal performance standard of diagnostic X-ray units" subsequently, punitive action (fines) may be levied against the operator by the Bureau of Radiological Health (BRH).

In the interest of the public health and safety and for the operators protection the power supply adequacy "Test record" (see attached sample) must be filled out and signed by the operator in charge, each and every time the portary is set-up in a new location.

The test record must remain with the equipment for possible inspection by radiation health officers.

Caution radiation:



8. With the exposure button (10) take a position of at least 6 feet away from the X-ray head with the digital display of the power supply test instrument still legible.

Make an Exposure



Note value displayed on the instrument during exposure on test record.

Attention:

During exposure the yellow LED may come on. This is a normal condition if the line voltage regulation exceeds 3V.

9. To calculate the power supply adequacy enter the displayed values of the test instrument:

Remove lead CAP from collimator cone and store in case.

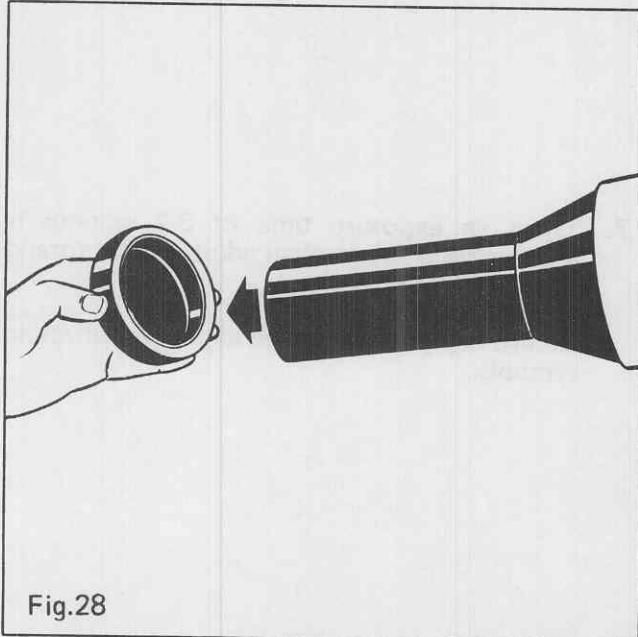


Fig.28



Fig.29

## OPERATION

### Preparation for exposure

Seat the patient, adjust the HELIODENT 70 to the patient.  
(We recommend the use of a lead apron for the patient as added protection).

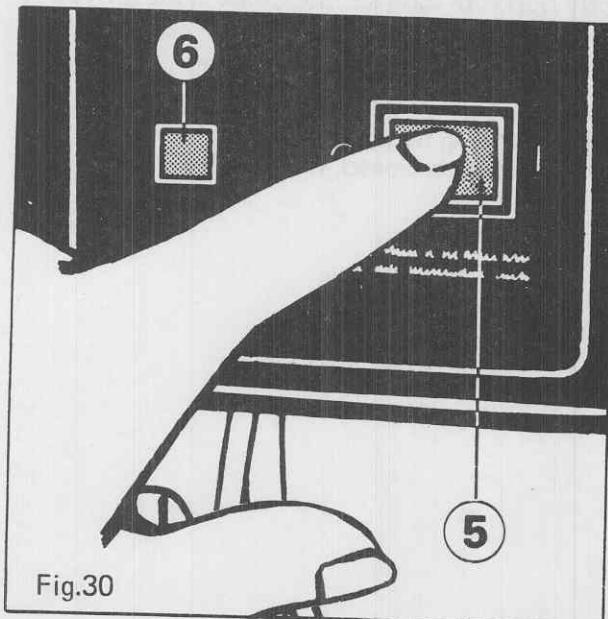


Fig.30

### Switch on the unit

With switch (5) Power-on-switch lights up (Green)

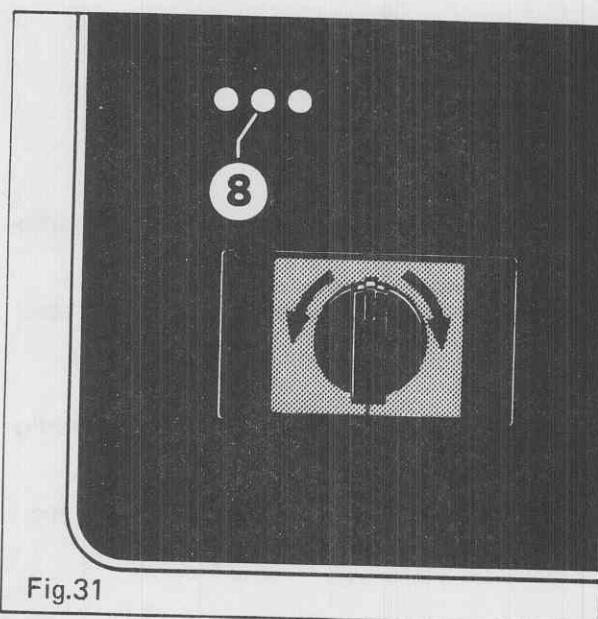


Fig.31

Check if the green lightdiode (8) is lit, proper line voltage exists.  
Your HELIODENT 70 is ready for operation.

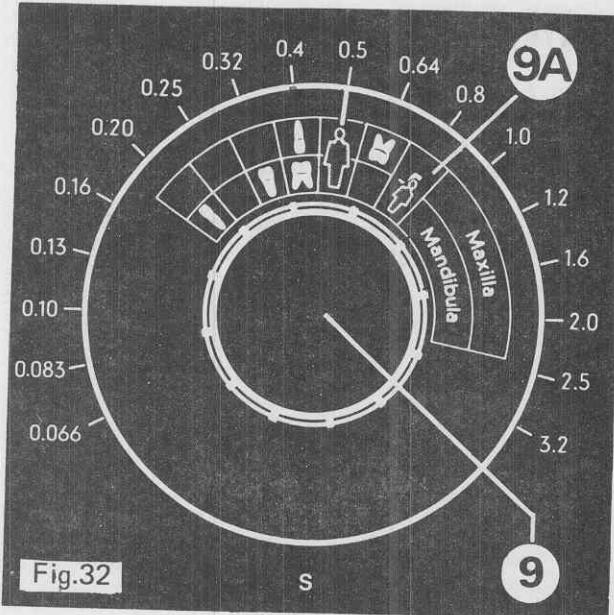


Fig.32

### Setting the base value for intraoral filmspeed

The basic setting for ultra-highspeed film class "D" e.g. KODAK DF 58 is factory adjusted and verified during installation/calibration of the unit.

Nevertheless check that the object of the upper molar ( maxilla) on the scale is exactly below the 0,64 sec. as shown.

If necessary corrections are made as follows:

- Gently press knob (9) against the front panel, to engage the object disc (9A).
- Slowly rotate the knob with object disc until upper molar is exactly opposite 0,64 sec.
- Release knob (9) to disengage object disc.

### NOTE:

Now and only now is the base value correctly set for ultra-highspeed film "D". If upper molar is not exactly opposite 0.64 seconds, base value is INCORRECT.

### NOTE:

The basic setting for ultra-highspeed film class "E", e.g. KODAK Ekta Speed, must be 0,32 sec.

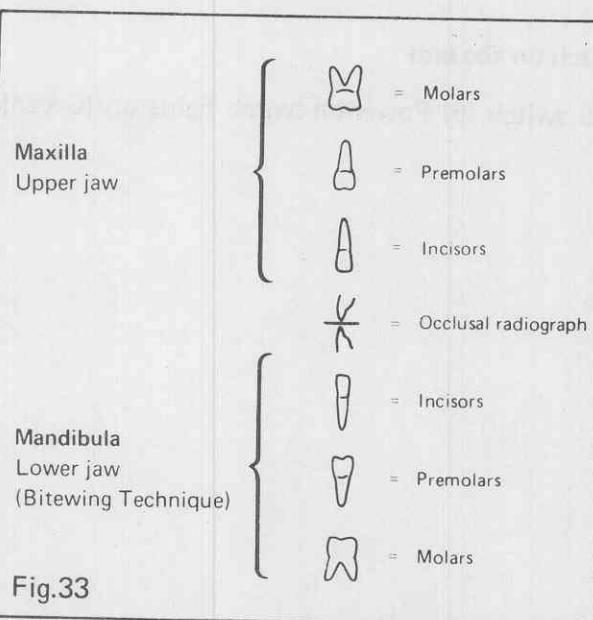


Fig.33

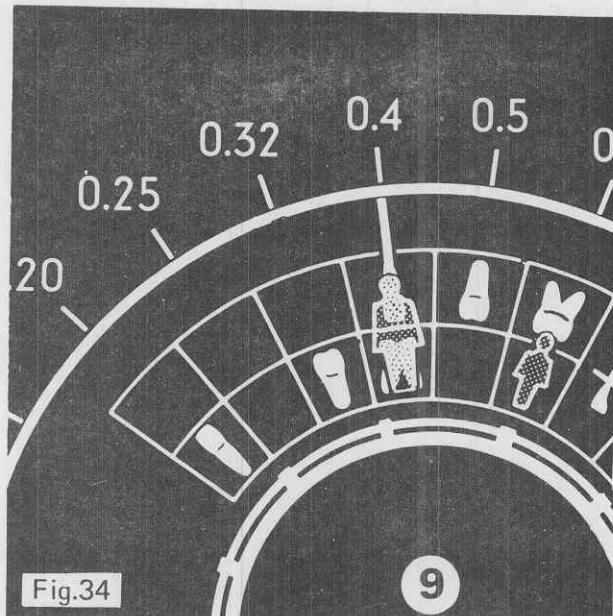


Fig.34

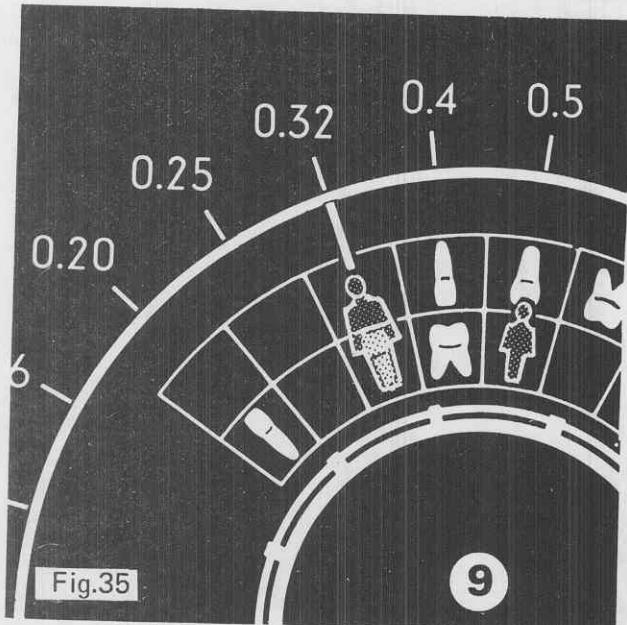
### Selection of the exposure

Adult patient

Turn knob 9 to align figure with tooth to be radiographed as shown  
(Cuspid – Lower Molar)  
Exposure time indicated by orange line is 0,4 sec.

Child patient

Turn knob 9 to align figure with tooth to be radiographed as shown  
(Upper Molar)  
Exposure time indicated by orange line is 0,4 sec.



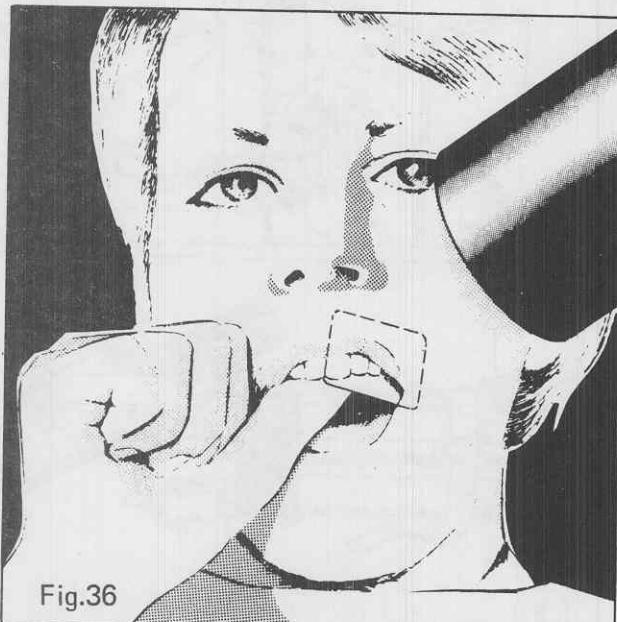
### Bitewing Technique

For bitewing exposure use mandibula teeth only as shown.

Example:

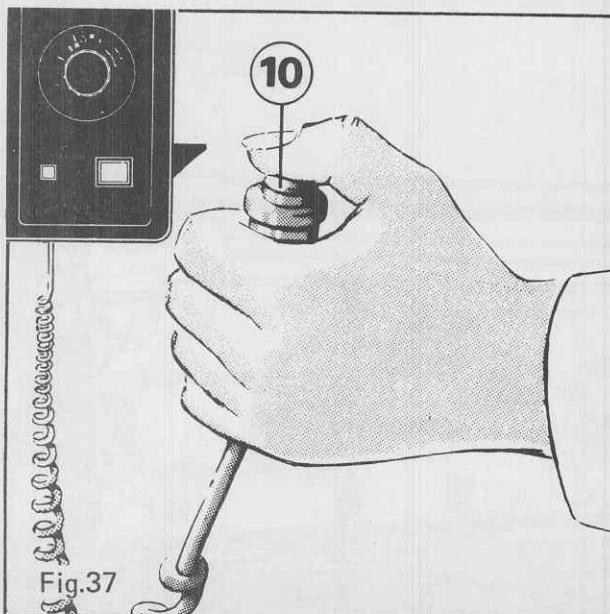
Adult — Pre-Molar (Mandible)

Exposure time indicated by orange line is 0,32 sec.



### Insertion of the film

Insert the film in the patient's mouth. The film is held by the patient or a filmclip may be used.



### Releasing the exposure



Depress the button on the handswitch (10). Fully depress the button and hold until the exposure terminates automatically.

The red pilot lights during the exposure period Simultaneously audible sound is present.

#### IMPORTANT

If the button is released before the set exposure time is over, the exposure is terminated prematurely.

## Rerepacking

Disconnect unit from power supply

1

Remove X-Ray Arm assembly (10) first!!

Place safety strap over scissor arm as shown.

**CAUTION!** Failure to follow this procedure may cause injury, and/or damage to the scissor arm (the arm is spring loaded).

Loosen locking ring, disconnect multi pin connector, disengage scissor arm assembly from coupling as shown, place protective sleeve (23) over multi pin connector (11), route greenfield tubing tighten strap (9).

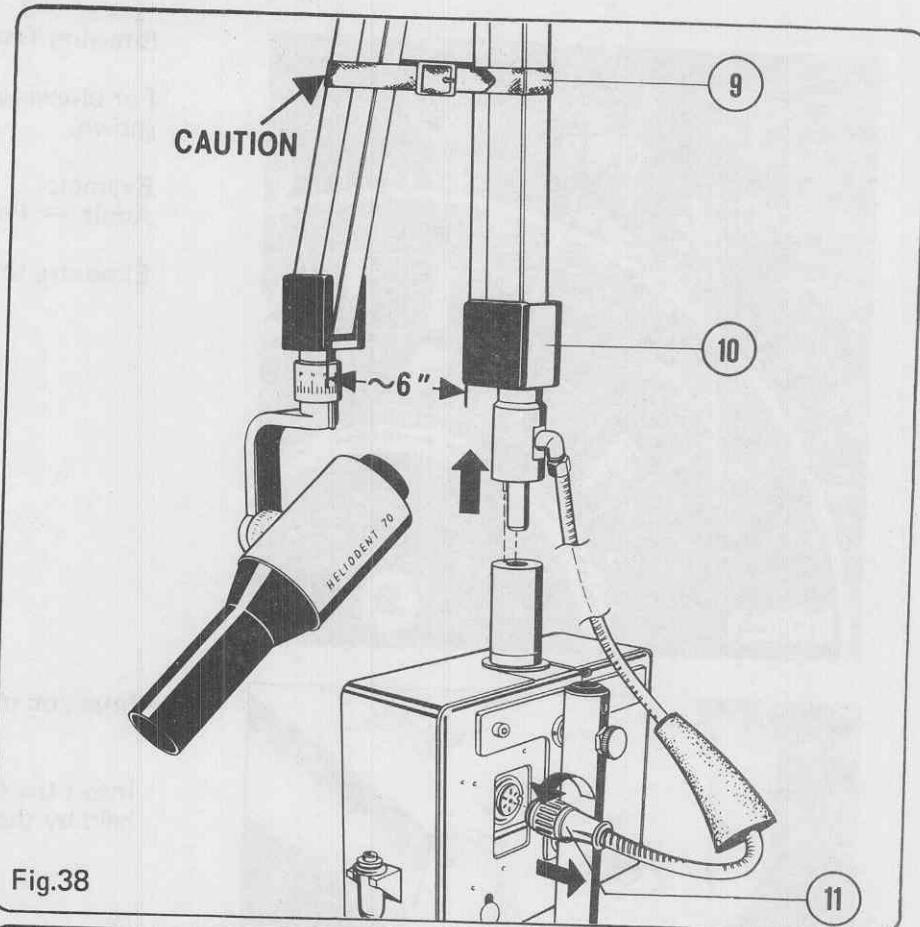


Fig.38

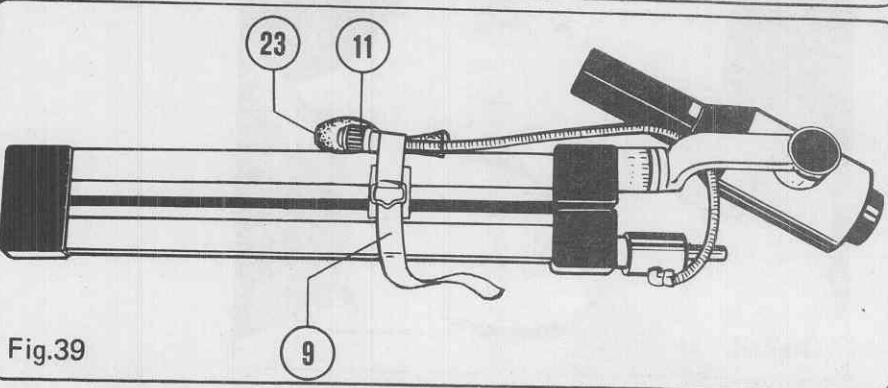


Fig.39

Remove all other components.

Fold support bars (4) and (5), secure with bracket (3) in the direction of arrow.

Store leveling brackets (20) as shown and secure.

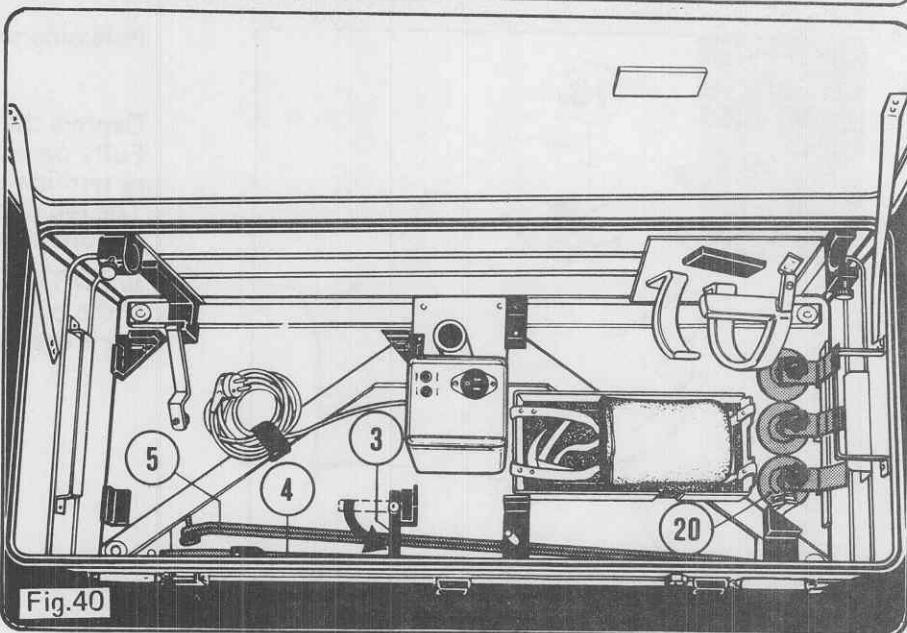
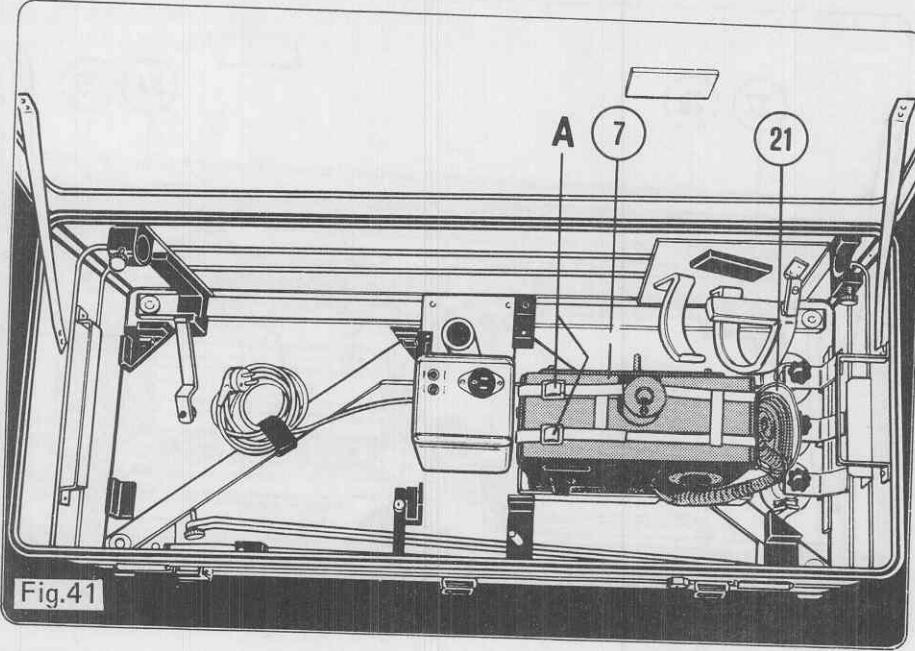
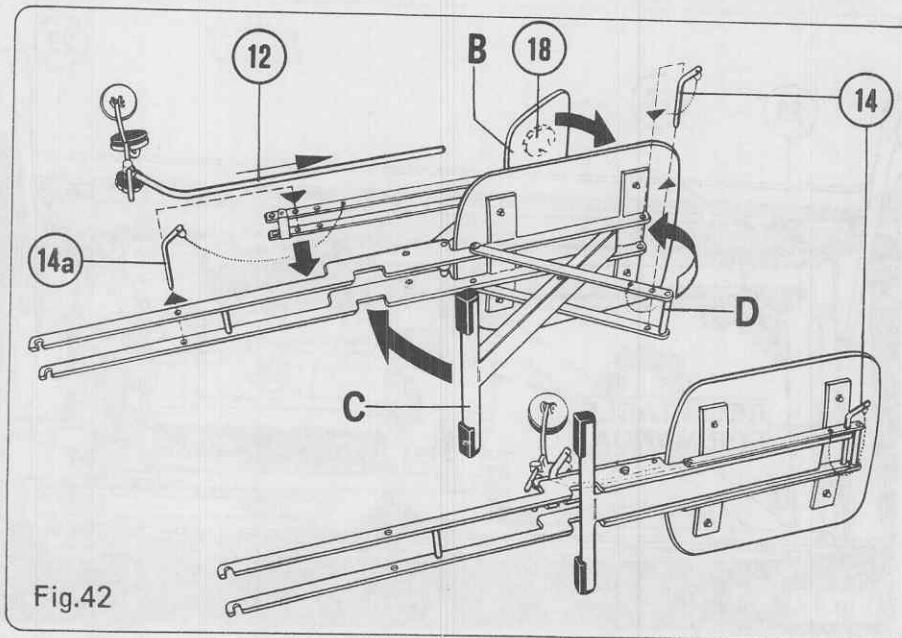


Fig.40



**2**

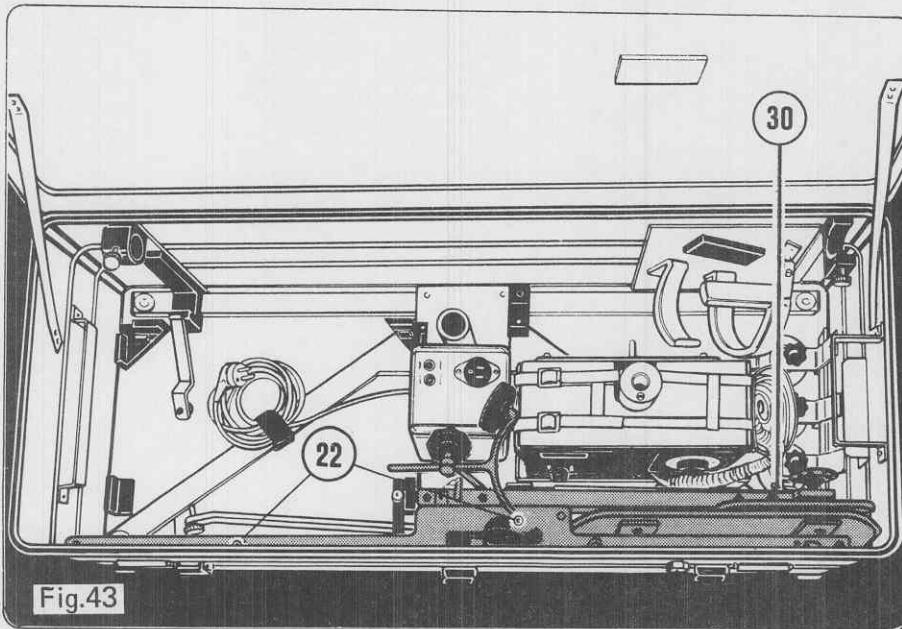
Place X-Ray control (7) into cradle, store power cord and exposure cord in pouch (21). Secure control as shown (A).



**3**

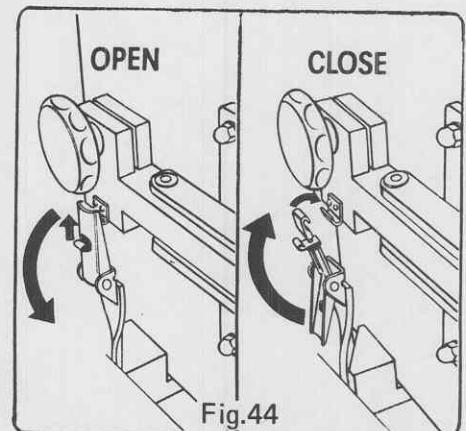
Remove headrest assembly (12). Remove pin (14a) and store in backrest brace. Fold backrest (B). Insert headrest assembly (12) in the direction of arrow, secure with knob (18).

Remove safety pin (14), fold stool leg (C) and retainer bracket (D), secure with safety pin as shown.



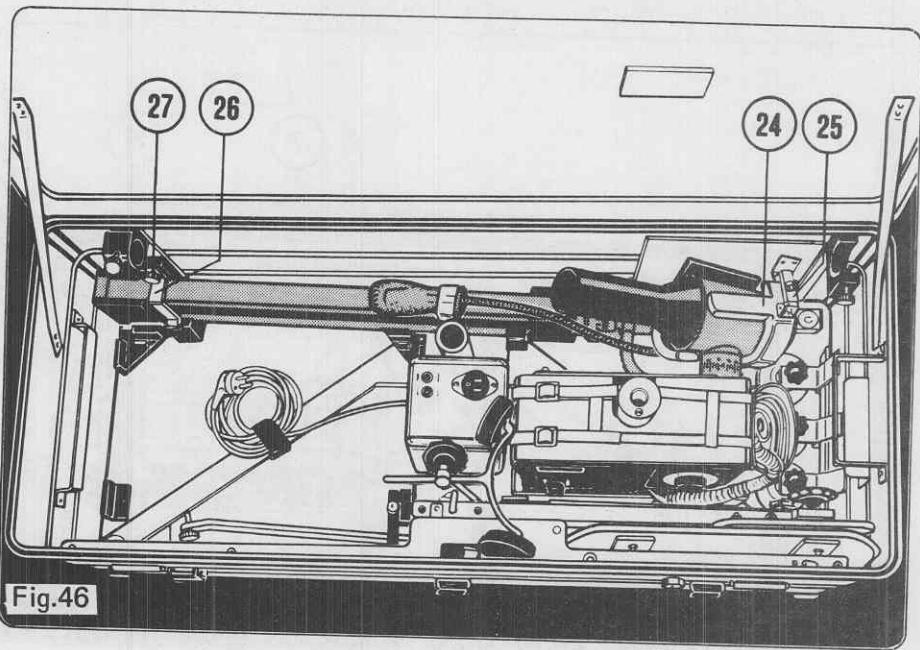
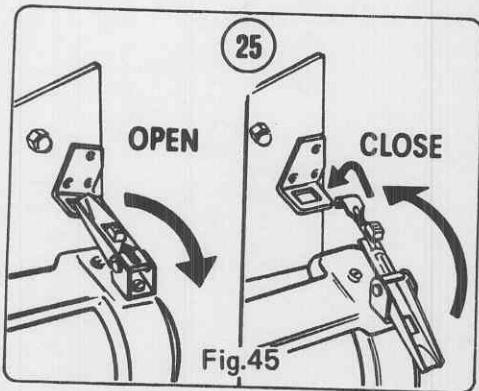
**4**

Place stool assembly into case, watch for dowel pins (22) to engage as shown. Secure (CLOSE) with fastener (30).



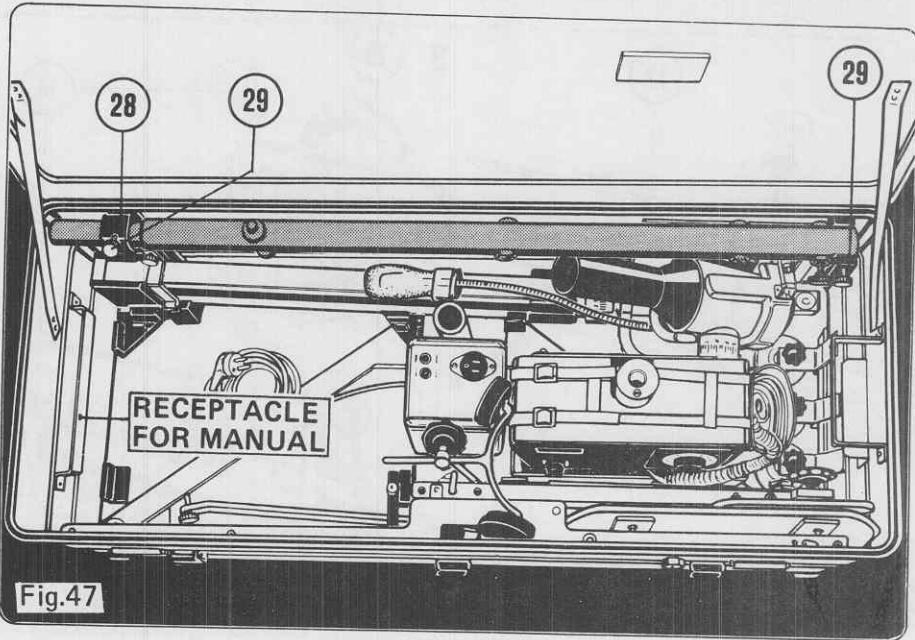
## 5

Raise brackets (24) and (26) OPEN, place scissor arm with X-Ray head into cradle. Secure brackets with fasteners (25) and (27) CLOSE.



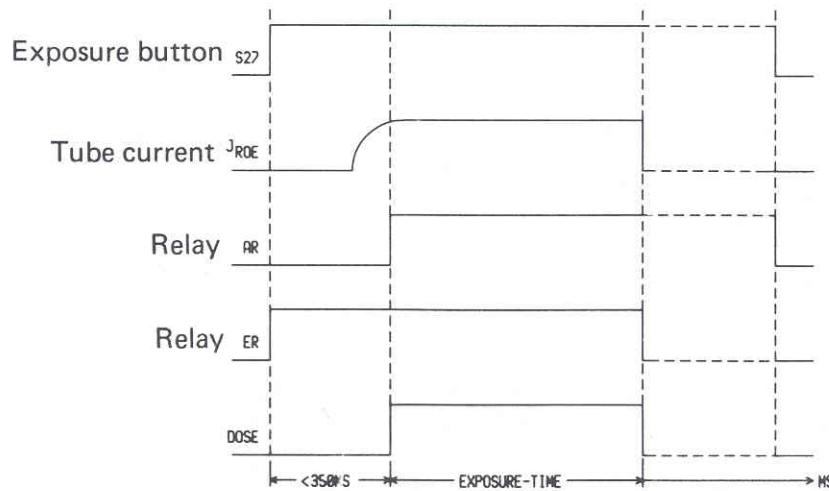
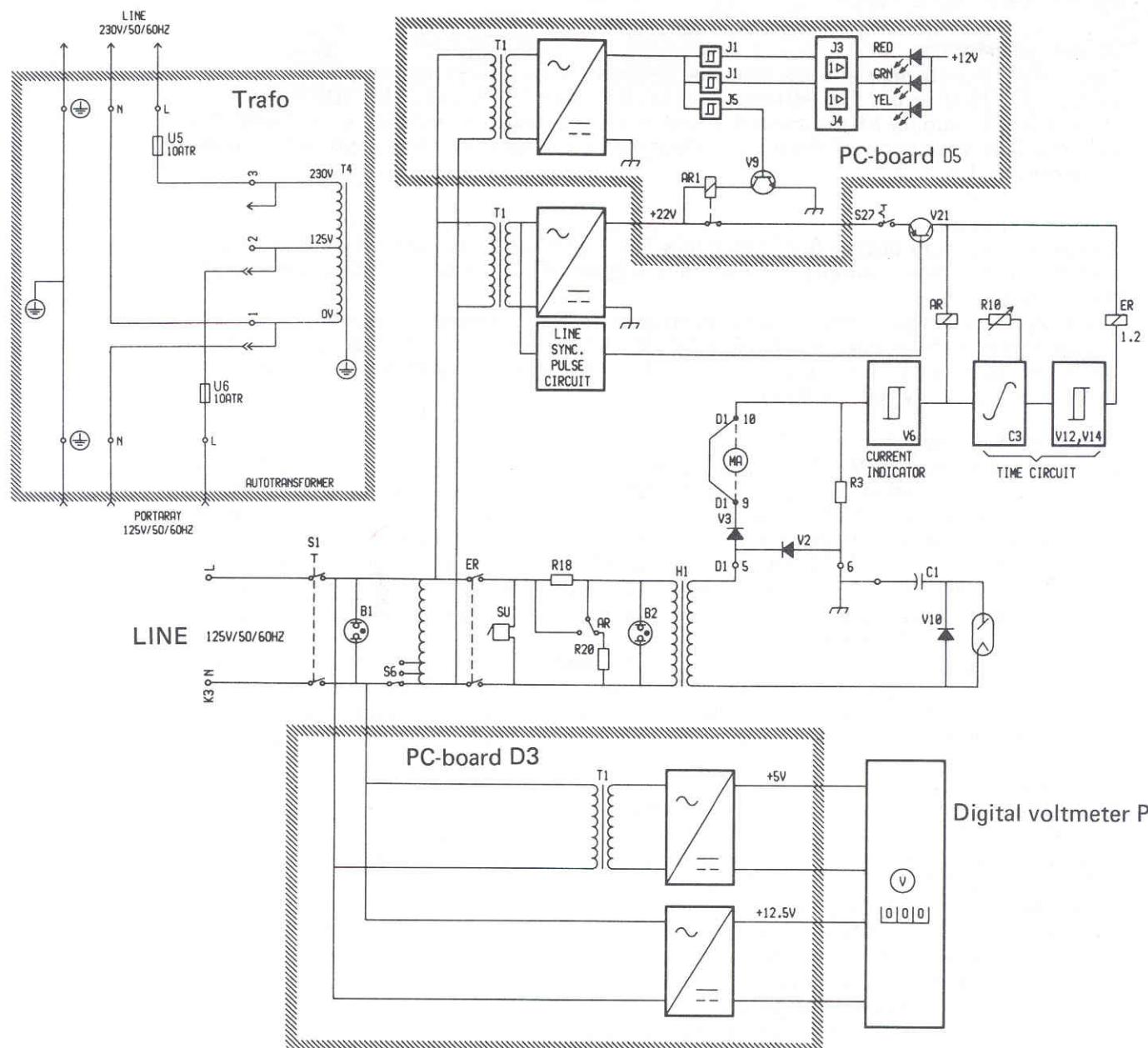
## 6

Guide upright through grommet (28) as shown, secure both ends to the case with two knurled knobs (29).



## THEORY OR PRINCIPLES OF OPERATION.

**Logic block diagram**



## DESCRIPTION OF FUNCTION

### Line input

The line input is protected with the fuses U 2 and U 3. The readiness indicating B 1 lamp lights if the switch S 1 is on.

### Control transformer

The control transformer ensures that the Heliudent 70 is always operated with a primary voltage of 125 V in the line voltage range of 109 V to 133 V at 60 HZ, 109 V to 132 V at 50 HZ. The supply of the control transformer is changed to such an extent with the switch S 6 as a function of the input voltage that a voltage of 125 V is measured between the terminals T 3.1 - 7.

### Start of Exposure

Depressing exposure button S 27 the relays ER 1 and ER 2 are controlled via V 21 synchronized to the power supply. The schmitt trigger (V 12, V 14) switches and the ER relay energizes.

The relay contacts place the primary winding of the high-voltage transformer H 1 under voltage through the voltage divider R 18/R 20. At the same time the buzzer SU and the radiation indicator B 2 are caused to operate and indicate the duration of the X-ray acoustically and optically.

### Exposure (Current path)

The base of transistor V 19 is supplied with power supply synchronized positive half waves and a square wave collector output. This output is differentiated by C 8 and R 30. The positive peak controls the transistor V 20, diode V 23. The inverted peaks are collected at base V 21, when exposure button S 27 is depressed V 21 turns the timer on. The voltage via dividers R 31, R 32 controls V 20 and V 21 as long as S 27 is depressed. Since the capacitor C 3 is not yet charged, the transistor V 12 is blocked. V 14 obtains base current through the resistor R 12/R 14, and is then switched through. As a result, the relays ER 1 and ER 2 energize.

The emitter current of V 14 flows through the potentiometer R 13 and causes a voltage drop in it. It is thus possible to adjust the threshold voltage of the Schmitt trigger consisting of V 12/V 14, the transistor V 12 can be controlled through only once its base voltage exceeds the value of 0.7 V + on R 13.

### Switching relay AR

As soon as the tube current allows a voltage drop on the resistor R 3 which is greater than  $U(V4) = 2.4 \text{ V} + U(V5) = 0.7 \text{ V} + U(V6) = 0.7 \text{ V}$ , the transistor V 6 is controlled through. Then, the transistor V 7 is also controlled through R 9. The collector current of V 7 allows the AR relay to draw. This relay places the Heliudent 70 transformer under a voltage of 125 without damping.

The collector current of V 7 flows, at the same time through V 8, R 8, R 5 to the base of V 6, and keeps V 6 in the overmodulated state (flip-flop function). The capacitor C 7 and C 2 serve for interference suppression.

The transistor V 7 also controls the transistor V 17. This transistor serves as an impedance converter and provides a supply voltage stabilized by V 18 to the integrator, consisting of R 10 and C 3. The exposure times of 0.066 to 3.2 sec. are set in 18 steps with R 10.

### End of exposure

As soon as C 3 is charged to the threshold voltage, which is adjusted with R 13, the transistor V 12 switches through. This initiates a flip-flop process. On the one hand, the transistor V 12 short circuits the base section of V 14, so that the current through ER is reduced; on the other hand, the voltage drop on R 13 decreases, so that the transistor V 12 is controlled through even faster. Thus, the ER relays drop.

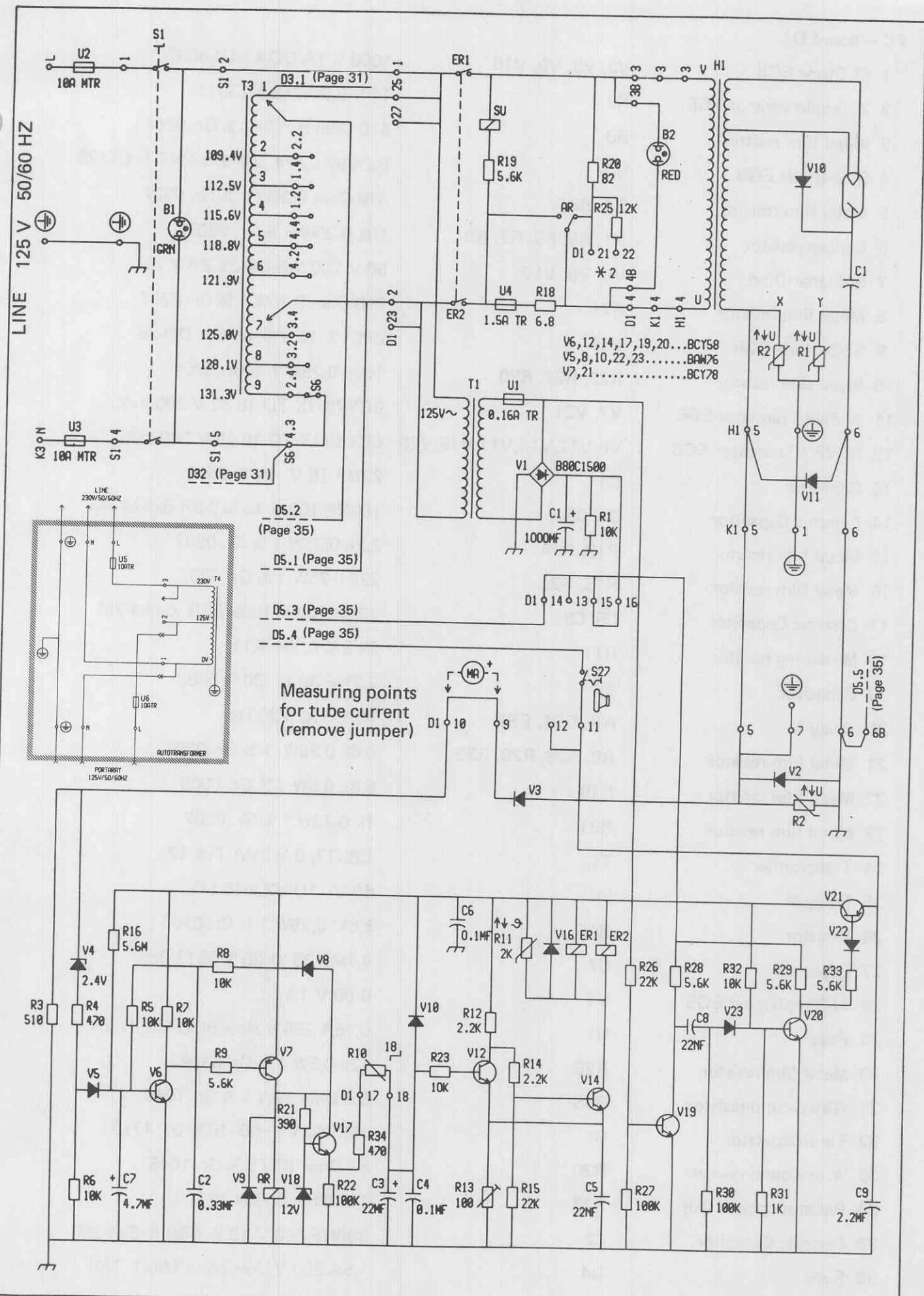
### Temperature compensation

The R 11 hot wire compensates the temperature response of the entire circuit in the 10° to 70° C range.

### Forced exposure

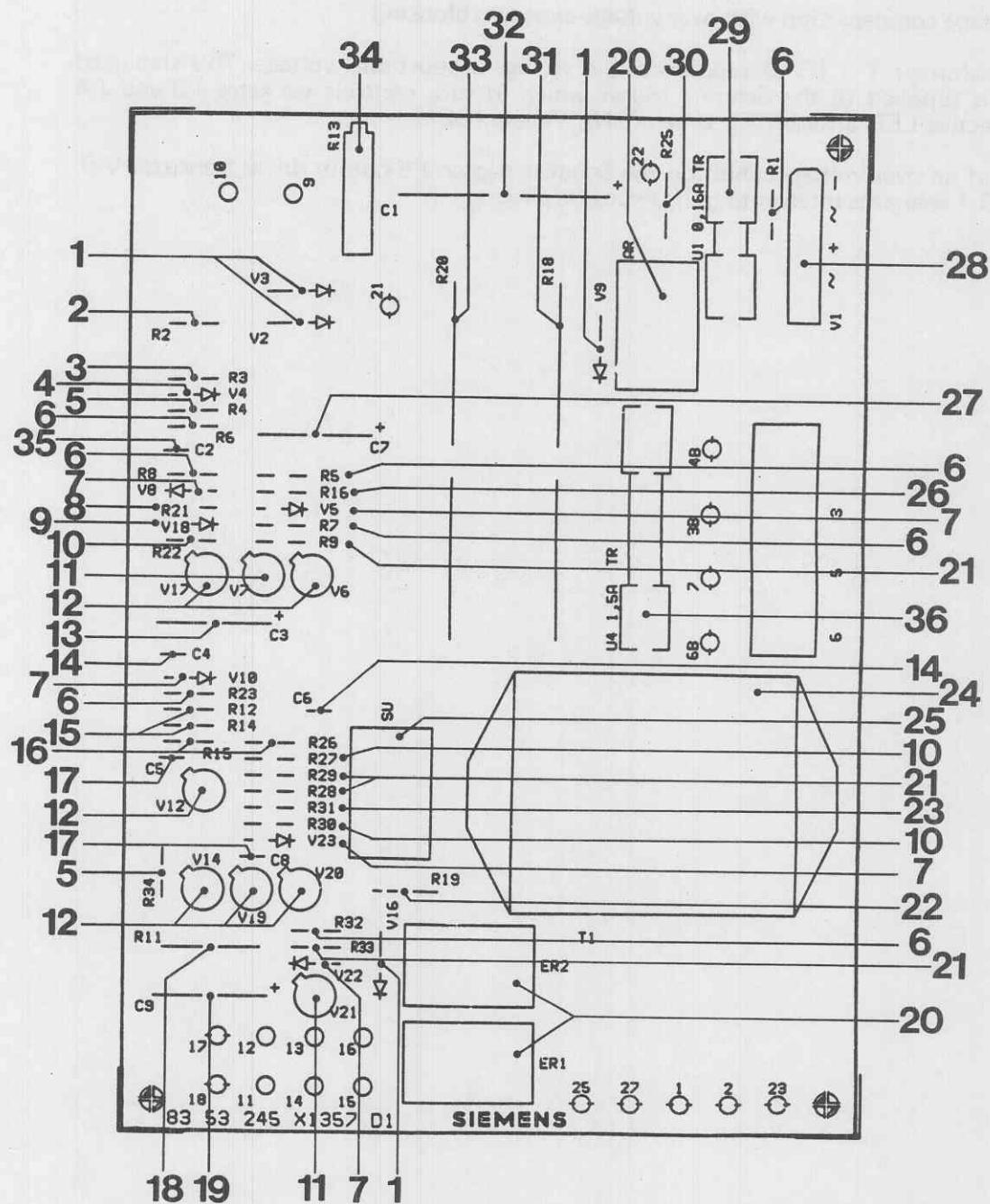
In case of a defect where no tube current signal triggers the Dentotime there is a forced switching system. The capacitor C 7 is charged through the resistor R 16 after switching on.

If no tube current pulse triggers the Dentotime, the transistor V 6 is controlled through over R 16 after approximately 0.7 to 1 sec. and the timer circuit is actuated.



**PC – board D1**

1 SI-Diode EGB	V2, V3, V9, V16	1000 V 1A DO-41 1N 4007
2 Zinkoxid varistor EGB	R2	14 V 0,05W 069-X3011
3 Metal film resistor	R3	510 Ohm 0,25W 1 % Gr. 0207
4 SI-Z-Diode EGB	V4	BZX 97 C2V4 2,4 V 0,4W 5 % DO-35
5 Metal film resistor	R4, R34	470 Ohm 0,25W 1 % Gr. 0207
6 Carbon resistor	R1, R5, R6, R7, R8	10k 0,25W 5 % Gr. 0207
7 SI-Planar-Diode	V5, V8, V10	50 V 200 mA DO-35 BAW 76
8 Metal film resistor	R21	390 Ohm 0,25W 1 % Gr. 0207
9 SI-Z-Diode EGB	V18	ZPD12 12 V 0,4W 5 % DO-35
10 Metal film resistor	R22, R27, R30	100k 0,25W 1 % Gr. 0207
11 SI-PNP-Transistor EGB	V7, V21	BCY78 IX TO-18 32 V 200 mA
12 SI-NPN-Transistor EGB	V6,V12,V14,V17,V19,V20	BCY59 IX TO-18 45 V 200 mA
13 Capacitor	C3	22MF 16 V- 20 % 0513
14 Ceramic Capacitor	C4, C6	100NF 100 V 10 % W5R 8x8x4-2M
15 Metal film resistor	R12, R14	2,2k 0,25W 1 % Gr. 0207
16 Metal film resistor	R15, R26	22k 0,25W 1 % Gr. 0207
17 Ceramic Capacitor	C5, C8	22NF 100 V 10 % W5R 7x5x4-2M
18 Measuring resistor	R11	2k 5 % 0,1W K11
19 Capacitor	C9	2,2MF 35 V- 20 % 0408
20 Relay N	AR, ER1, ER2	12 V- 1U V23016
21 Metal film resistor	R9, R28, R29, R33	5,6k 0,25W 1 % Gr. 0207
22 Metal film resistor	R19	5,6k 0,5W 1 % Gr. 0309
23 Metal film resistor	R31	1k 0,25W 1 % Gr. 0207
24 Transformer	T1	125/17, 5 V 3VA Typ 42
25 Relay N	SU	60 V- 1U V23016 LO
26 Resistor	R16	5,6M 0,25W 1 % Gr. 0207
27 Capacitor	C7	4,7MF 35 V- 20 % 0513 Dry
28 SI-Rectifier set EGB	V1	B 80 V 1A
29 Fuse	U1	0,16A 250 V slow blow 5x20 mm
30 Metal film resistor	R25	12k 0,5W 1 % Gr. 0309
31 Wire wound resistor	R18	6,8 Ohm 10W 5 % Gr. 1045
32 Elko/Capacitor	C1	1MF 40 V- +50 -10 % Gr. 17x31
33 Wire wound resistor	R20	82 Ohm 10W 5 % Gr. 1045
34 Resistor spindel Adj.	R13	100 Ohm 0,75W 10 %
35 Ceramic Capacitor	C2	330NF 100 V 10 % W5R 8x8x4-2M
36 Fuse	U4	1,5A 250 V slow blow 1/4x1 1/4"



## Digital Voltmeter "P" PC board D3

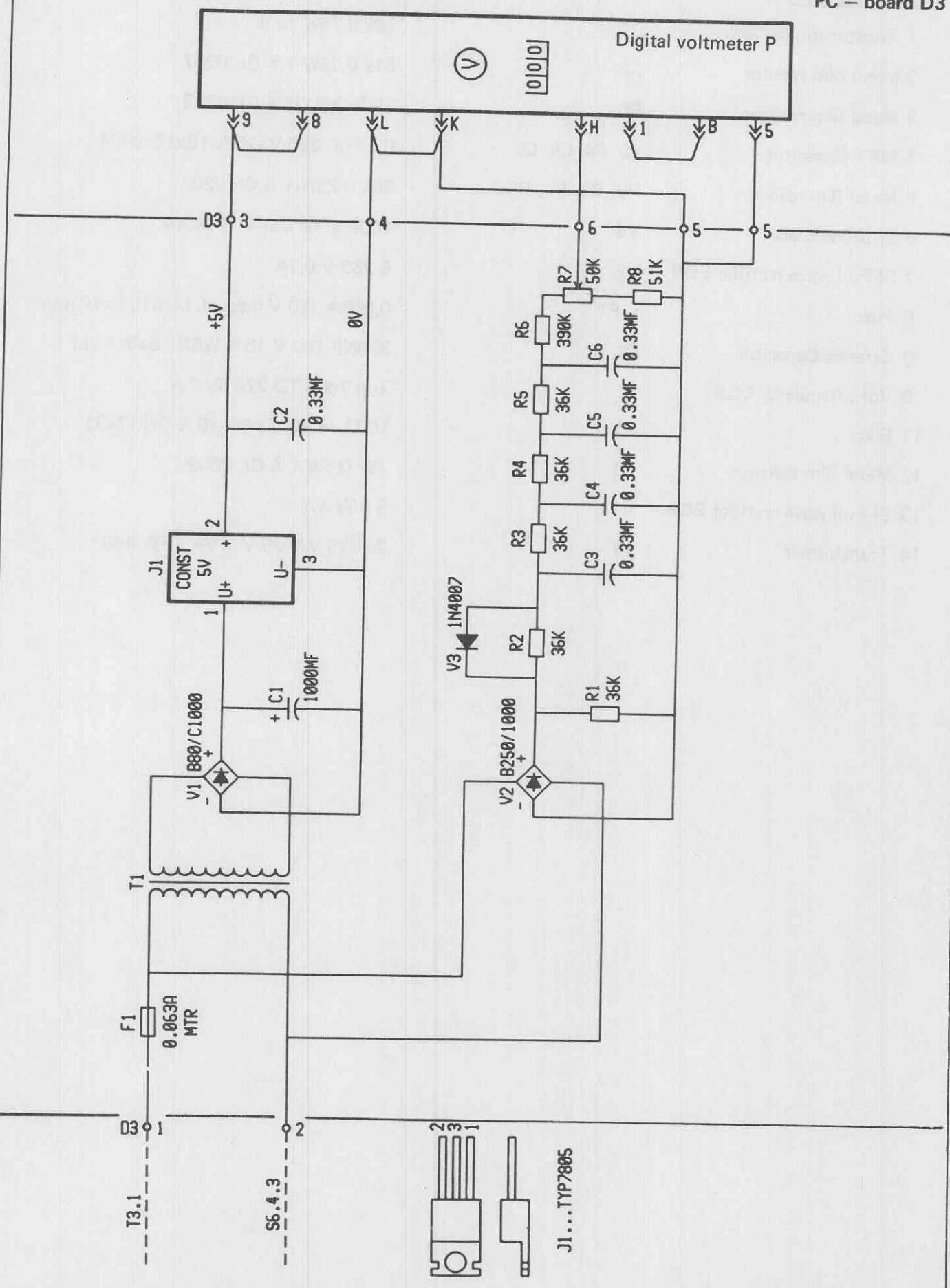
### Principle

The digital instrument "P" receives a rectified filtered 12.5 V measuring voltage, proportional to a 125 V line voltage input. The power supply to the instrument consists of the transformer T 1 (D 3) and a 5 VDC circuit.

### Line voltage compensation with over voltage exposure blocking

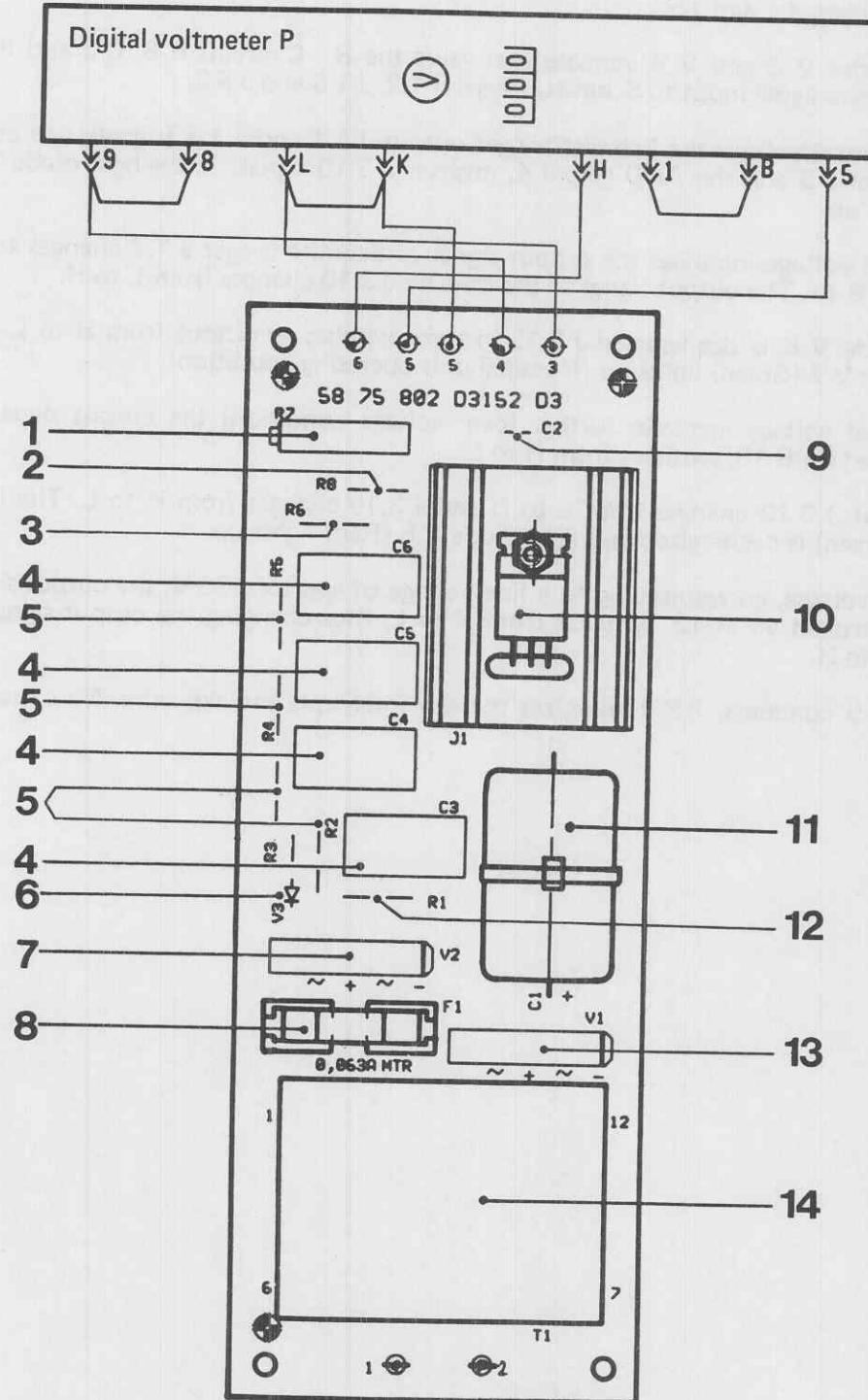
The transformer T 1 (D 5) supplies a line voltage proportional voltage. This stabilized voltage is supplied to the Schmitt trigger which in turn controls via gates J 3 and J 4 the respective LED'S Red (RT), Green (GN), Yellow (GE).

In case of an over voltage condition the Schmitt trigger J 5 output drives transistor V 9, relay AR 1 energizes interrupting the exposure circuit.



**PC – board D3**

1 Resistor spindel Adj.	R7	50k 0,75W 10 %
2 Metal film resistor	R8	51k 0,25W 1 % Gr. 0207
3 Metal film resistor	R6	390k 0,5W 1 % Gr. 0309
4 MKT-Capacitor	C3, C4, C5, C6	0,33 uF 250 V -20 % 18x15x9-6M
5 Metal film resistor	R2, R3, R4, R5	36k 0,25W 1 % Gr. 0207
6 SI-Diode EGB	V3	1000 V 1A DO-41 1N4007
7 SI-Full wave rectifier EGB	V2	B 250 V 0,7A
8 Fuse	f. F1	0,063A 250 V med. sl. bl. S10 5x10 mm
9 Ceramic Capacitor	C2	330NF 100 V 10 % W5R 8x8x4-2M
10 Volt. Regulator EGB	I1	Typ 7805 TO-220 5V/1A
11 Elko	C1	1000 uF 40 V +50 -10 % Gr. 17x31
12 Metal film resistor	R1	36k 0,5W 1 % Gr. 0309
13 SI-Full wave rectifier EGB	V1	B 80V 1A
14 Transformer	T1	2x 115 V/2x 6 V 4VA TFB 468



### Linevoltage indication and over voltage exposure interruption PC board D5

The 15 V stabilizer J 2 receives its input voltage from the power supply of the timing switch board D 1. The transformer T 1 (D 5) supplies via rectifier V 1 the voltage for the Schmitt triggers J 1 and J 5.

The zener diodes V 3 and V 4 increase that value the R - C circuit R 8, C 3 and R 5, C 4 smoothen the signal input to Schmitt, trigger J 1.2, J 1.6 and J 5.2.

At a lower control voltage the Schmitt trigger output J 1.1 and J 1.7 (signals) are at H. Via the inverter J 3 and the AND gate J 4, inverter J 3.10 signals L, the light diode V 6 (yellow) lights up.

As the control voltage increases the output signal of Schmitt trigger J 1.7 changes to L, controlled by R 11. The output signal of the inverter J 3.10 changes from L to H.

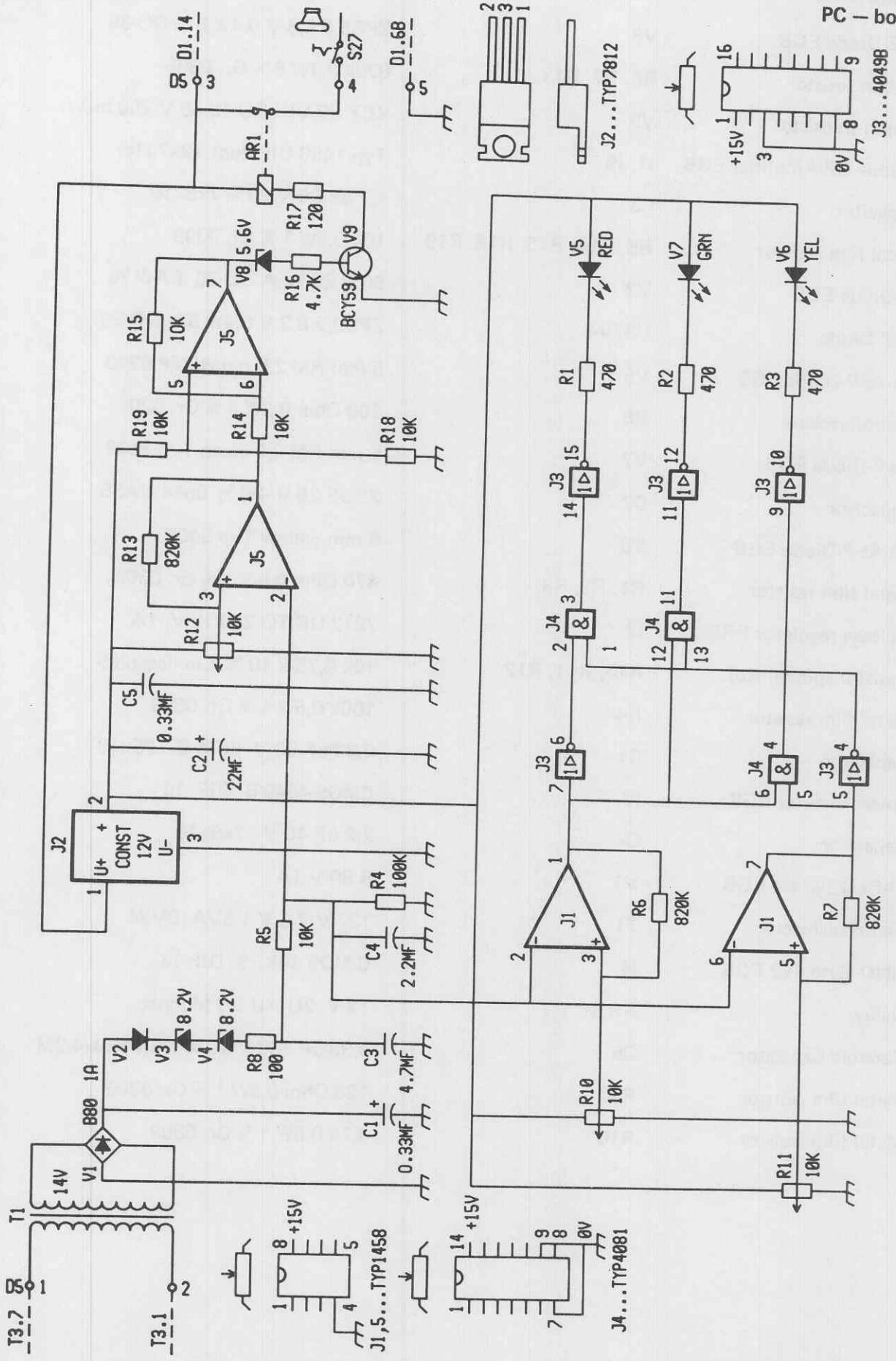
The light diode V 6 is deenergized J 3.12 in turn switches to output from H to L and the light diode V 7 (Green) lights up (Nominal unit operating condition).

As the control voltage increases further (over voltage condition) the output signal of J 1.1 controlled via R 10, switches from H to L.

The output of J 3.12 changes from L to H and J 3.15 changes from H to L. The light diode V 7 (Green) is deenergized and light diode V 5 (Red) lights up.

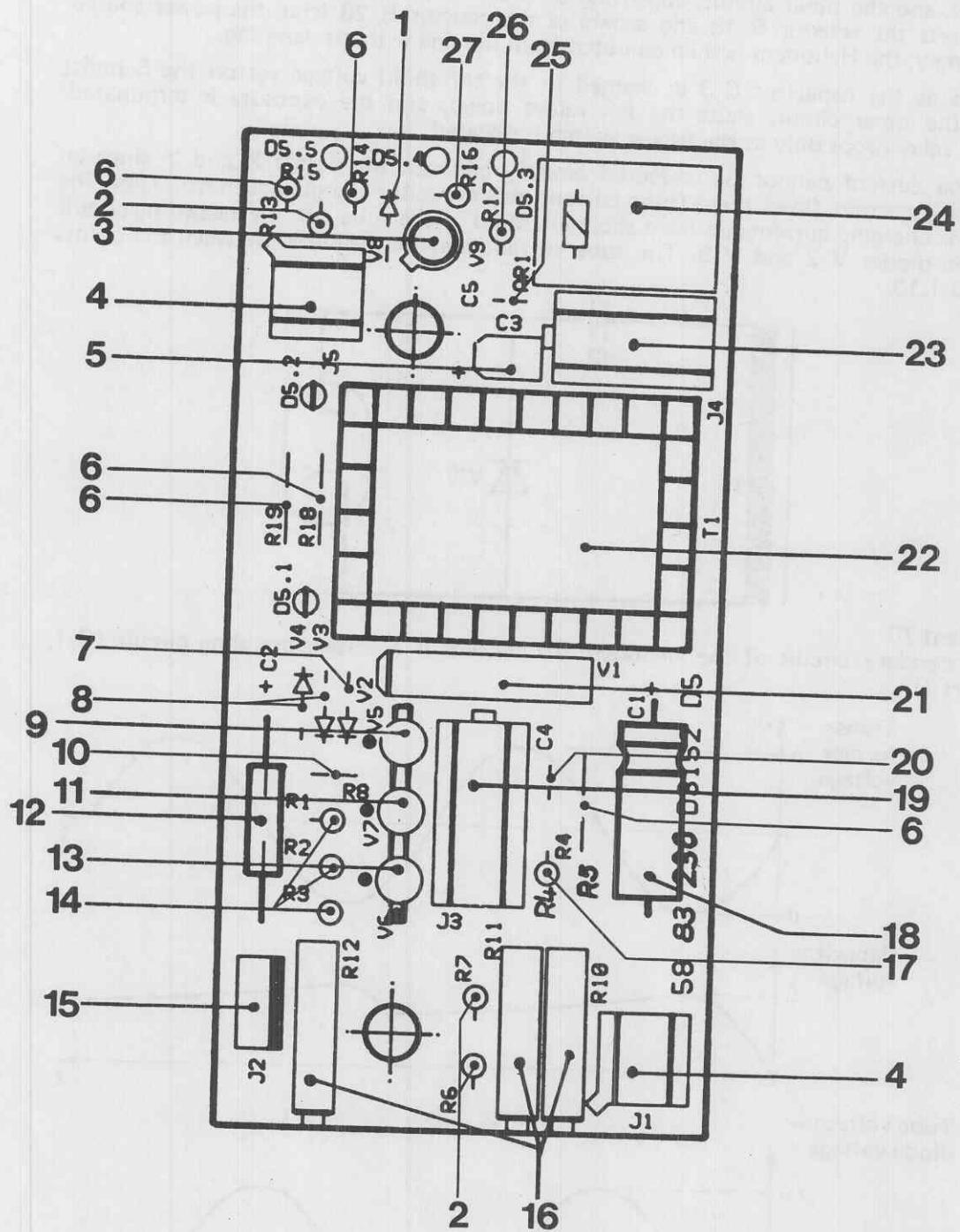
At a control voltage, corresponding to a line voltage of approx. 130 V, the output signal of J 5.1 controlled via R 12, switches from H to L, thus changing the output signal of J 5.7 from L to H.

Transistor V 9 conducts, AR 1 energizes thereby interrupts the exposure. No exposure can be made.



PC – board D5

1 SI-Z-Diode EGB	V8	ZPD5,6 5,6 V 0,4W 5 % DO-35
2 Carbon resistor	R6, R7, R13	820k 0,4W 5 % Gr. 0309
3 SI-npn-transistor	V9	BCY 59 VIII TO-18 45 V 200 mA
4 Double-OP-Amplifier EGB	I1, I5	Typ 1458 DIP 8pol. (2x741c)
5 Capacitor	C3	4,7 uF 35 V 20 % 7x5x10
6 Metal film resistor	R5, R14, R15, R18, R19	10k 0,5W 1 % Gr. 0309
7 SI-Diode EGB	V2	50 V 200 mA DO-35 BAW 76
8 SI-Z-Diode	V3, V4	ZPD8,2 8,2 V 0,4W 5 % DO-35
9 Ga-As-P-Diode EGB	V5	5 mm RM 2,5 red HLMP 0240
10 Carbon resistor	R8	100 Ohm 0,2W 5 % Gr. 0204
11 Ga-P-Diode EGB	V7	5 mm RM 2,5 green Typ 3502
12 Capacitor	C2	22 uF 25 V -20 % 0614 NASS
13 Ga-As-P-Diode EGB	V6	5 mm yellow Typ 3400
14 Metal film resistor	R1, R2, R3	470 Ohm 0,5W 1 % Gr. 0309
15 Voltage regulator EGB	I2	7812 UC TO-220 12 V, 1A
16 Resistor spindel Adj.	R10, R11, R12	10k 0,75W 10 % Lin liegend S
17 Metal film resistor	R4	100k 0,5W 1 % Gr. 0309
18 Capacitor	C1	0,33 uF 63 V -20 % Gr. 06x19
19 Power inverter EGB	I3	CMOS 4049 B DIP 16
20 Capacitor	C4	2,2 uF 40 V- 7x5x10
21 SI-Rectifier set EGB	V1	B 80 V 1A
22 Flat transformer	T1	127 V/9,5 V 1,8VA BV34
23 AND-Gate 4x2 EGB	I4	C MOS 4081 B DIP 14
24 Relay	AR 1	12 V -2U AU LO Monost.
25 Ceramic-Capacitor	C5	0,33 uF 100 V 10 % W5R 8x8x4-2M
26 Metal film resistor	R17	120 Ohm 0,5W 1 % Gr. 0309
27 Metal film resistor	R16	4,7k 0,5W 1 % Gr. 0309



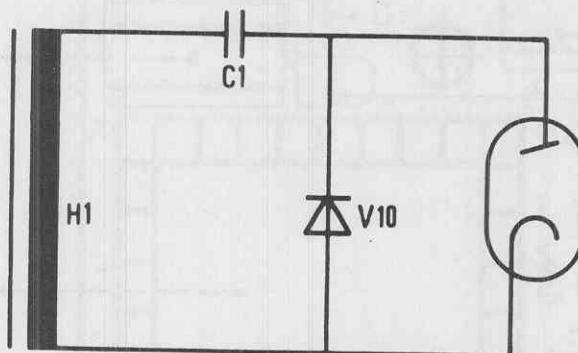
**PORTARAY**  
**Heliodent 70 Dentotime**

**Description of function**

The X-ray tube of the Heliodent 70 is indirectly heated, i. e., the heater and the high voltage are switched on at the same time. Thus, tube current flows only once the emission temperature of the filament is reached (after 150 to 250 msec). As soon as the peak tube current exceeds a given value, the Schmitt trigger (V 6) switches over, the AR relay energizes, and the timer circuit, consisting of C 3/R 10, V 12, V 14 is triggered. The AR relay shorts the resistor R 18 and separates the resistor R 20 from the power source. Accordingly, the Heliodent is then operated from the line without damping.

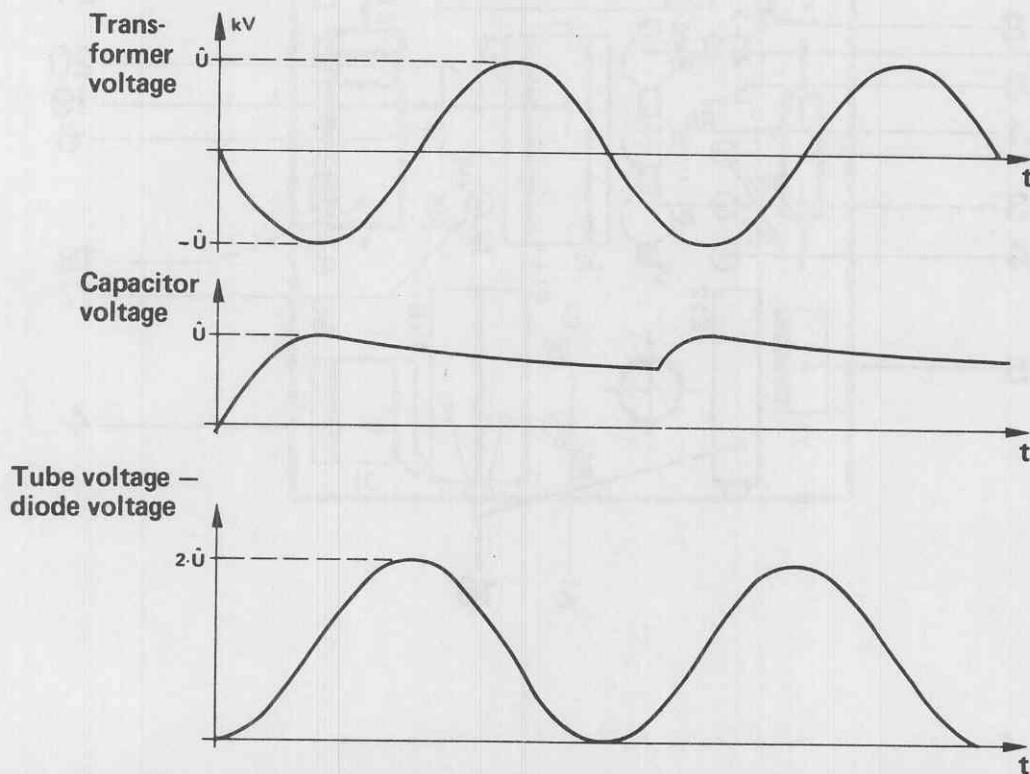
As soon as the capacitor C 3 is charged to the threshold voltage set on the Schmitt trigger the timer circuit shuts the ER relays down, and the exposure is terminated. The AR relay drops only as the trigger switch is released.

The tube current cannot be measured directly between the points X and Y since an alternating current flows there (tube current plus capacitor-charging current). Thus, the capacitor charging current has been short circuited in the tube current measuring circuit with the diodes V 2 and V 3. The tube current may be measured between the points D 1.9/D 1.10.



**Heliodent 70**

The secondary circuit of the Heliodent 70 consists if a voltage-doubling circuit (C 1, V 10, H 1).



The negative half wave of the transformer voltage charges the capacitor C 1. The positive half wave of the transformer voltage is added to the capacitor voltage, so that twice the transformer peak voltage is measured on the tube.

## **MAINTENANCE**

To stay in compliance with the DHHS requirements the PORTARAY must be maintained annually. It is the responsibility of the user to insure that the equipment is maintained with the manufacturer's recommended maintenance schedule to insure compliance with the Federal Performance Standard. The manufacturer and the assembler/installed are relieved from responsibility in those cases where noncompliance with the standard results from the user's failure to have the manufacturer's recommended maintenance performed..

The actual maintenance inspection and consequent service must be accomplished by a trained serviceman. Neither the inspection nor service is part of the equipment warranty.

### **Instruments required:**

Digital Multimeter MODEL – FLUKE 8000 A, or equivalent.

#### **Accuracy:**

AC voltage  $\pm 0.5\%$  of reading plus 1 digit

DC voltage  $\pm 0.1\%$  of reading plus 2 digits

DC current  $\pm 0.3\%$  of reading plus 1 digit

Electromechanical pulse counter

MODEL- KESSLER ELLIS KT 203  $\pm 1$  pulse, or equivalent.

Regulating transformer (stepless) 90 – 150 VAC, 50 VA

### **Check as follows:**

1. Verify that all labels are affixed and legible (labels see page 13)  
Look for mechanical damage, possibly affecting radiation safety, (inspect collimator for possible cracks, test the tubehead in all working positions for possible drift).
2. Operating LED light (yellow, green, red) for line compensation must light up Digital line adequacy voltmeter must be operational.

### **Corrective Action:**

Defaced labels must be replaced.

Order same from SIEMENS MEDICAL SYSTEMS, INC. Dental X-Ray Division (address see rear) in writing stating:

Customer Name

Customer Address

All Model Numbers with Serial Numbers still legible on the unit for identification purposes.

Should mechanical damage affecting radiation safety be evident, the user is not permitted to use the unit until repairs or replacements correcting the defect are made.

Defective bulbs for power "on" light, radiation indicating light, inoperative line compensation LED.s, Digital line adequacy voltmeter constitute a safety hazard to the patients well as to the operator, therefore, repairs or replacements must be made promptly, same rule as above applies.

### **WARNING! Radiation Safety**

**CAUTION: Radiation will be indicated by this symbol**



To reduce personal exposure and not damage the X-ray tube head, the individual exposure times shall be just long enough to permit meter readings.

Observe radiation protection as outlined in on page 12.

3. Check radiation warning light and acoustic buzzer for proper functioning,

4. Make sure the X-ray exposure is interrupted after releasing the exposure switch (dead man feature).

## Electrical Measurement / Calibration

Checking the line voltage  
(Power supply)

Remove cover .**CAUTION WIRES!**

Set the multimeter to a.c. voltage (range: 150V, a.c.). Connect the test leads to the terminals K3 N, L.

Turn on the power supply, note the measured value.

The measured line voltage must be at least 109V, A.C., and may not exceed 133 V, a.c.

\* Line voltage range at 50 HZ ONLY 132 V

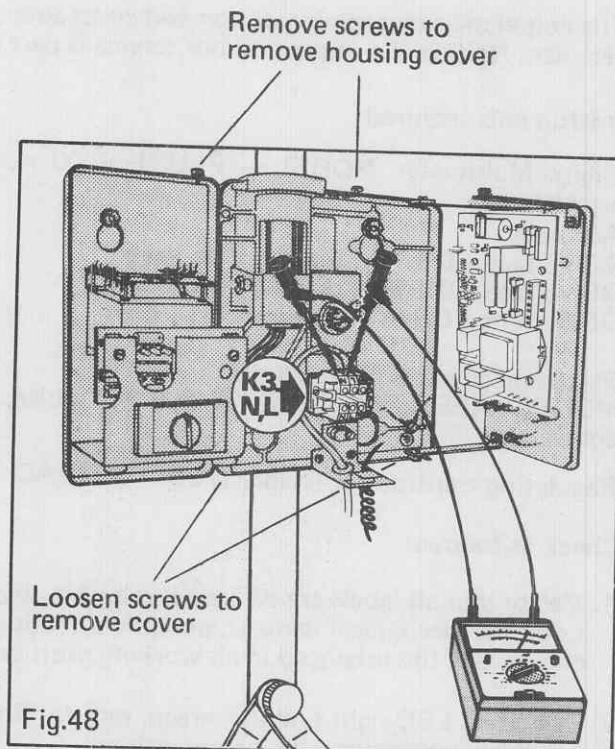


Fig.48

Digital line adequacy test instrument "P" (plus, minus 1 digit accuracy).

Plug in power supply.

Turn on the X-Ray control, wait 5 min (warm-up-time).

Compare the indicated value on the multimeter with the digital line adequacy test instrument. The values indicated must be within your multimeters stated accuracy tolerance.

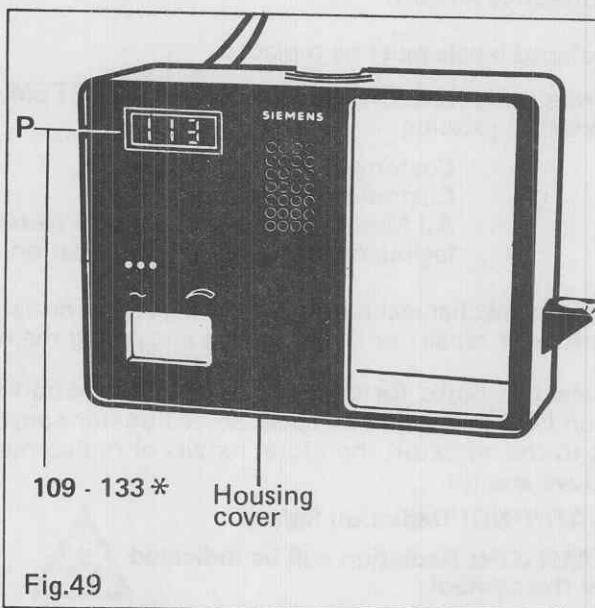


Fig.49

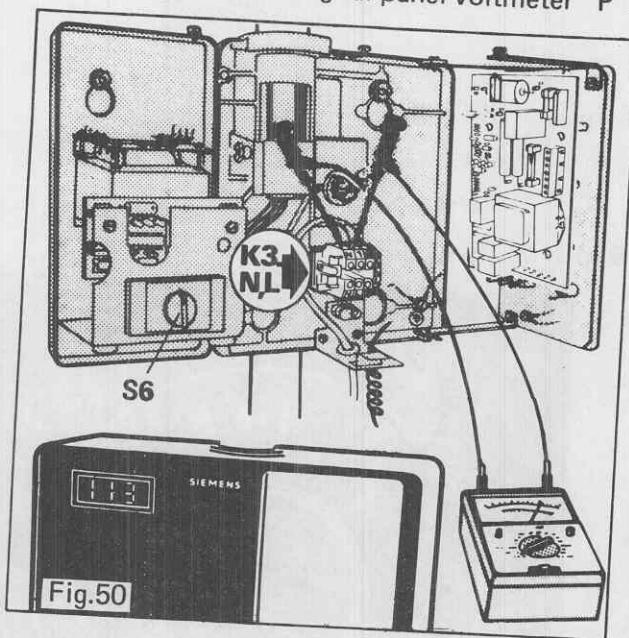
### WARNING:

Electric shock hazard!

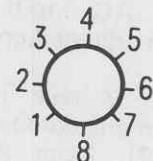
For reasons of safety, always disconnect the power cord while the measuring leads are connected to the various test points during the calibration.

**Verification of the line voltage compensation light diodes (LED) function.**

Determine that the power supply is within the specified range of 109 VAC to 133 VAC max. indicated on the digital panel voltmeter "P". Line voltage range at 50 HZ ONLY 132 V



**S6 Positions**



Dependent on the line voltage indicated and position of line compensation switch S6, the corresponding LED's Yellow, Green or Red light up.

On hand of Chart A compare:

Digitalinstrument 'P'	Switch S6								
	POSITION	1	2	3	4	5	6	7	8
109 V	GE						GE	GN	
110 V	GE						GE	GN	
111 V	GE					GE	GE/GN	GN/RT	
112 V	GE					GE	GN	RT	
113 V	GE					GE	GN	RT	
114 V	GE					GE	GN	RT	
115 V	GE					GE	GE/GN	GN/RT	RT
116 V	GE					GE	GN	RT	RT
117 V	GE					GE	GN	RT	RT
118 V	GE					GE	GN	RT	RT
119 V	GE					GE	GN	RT	RT
120 V	GE			GE		GE/GN	GN	RT	RT
121 V	GE			GE		GN	GN/RT	RT	RT
122 V	GE			GE		GN	RT	RT	RT
123 V	GE	GE		GE/GN		GN	RT	RT	RT
124 V	GE	GE		GN		GN/RT	RT	RT	RT
125 V	GE	GE		GN		RT	RT	RT	RT
126 V	GE	GE/GN		GN		RT	RT	RT	RT
127 V	GE	GN		GN/RT		RT	RT	RT	RT
128 V	GE	GN		RT		RT	RT	RT	RT
129 V	GE	GN		RT		RT	RT	RT	RT
130 V	GN	GN/RT		RT		RT	RT	RT	RT
131 V	GN	RT				RT	RT	RT	RT
132 V	GN	RT				RT	RT	RT	RT
133 V *	GN	RT				RT	RT	RT	RT

**Legend**  
GE = yellow  
GN = green  
RT = red

**Chart A**

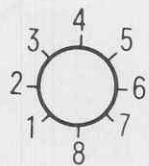
**Note:** A one position shift of the LED display in relation to the switch position S6 can occur if the actual line voltage lies in between the voltage values shown on the chart.

**E x a m p l e :**

Indicated line voltage – position of S6 – LED lit

Instrument "P"

121



1 to 3	Yellow
4	Green
5	Green or Red
6 to 7	Red

Y G R  
O O O

**Verify power supply adequacy**

With the multimeter connected to K3 N,L (see figure 48). AC input, unit turned on, linecompensation adjusted, green LED lit.

Verify that the voltage indicated on your measuring instrument coincides with instrument P (see figure 49). Note the value indicated (no load).

Set the exposure time by rotating the object button. To 3,2 s indicated by the orange line on the object/time selector.

Make an exposure



Observe the voltage reading (under load)

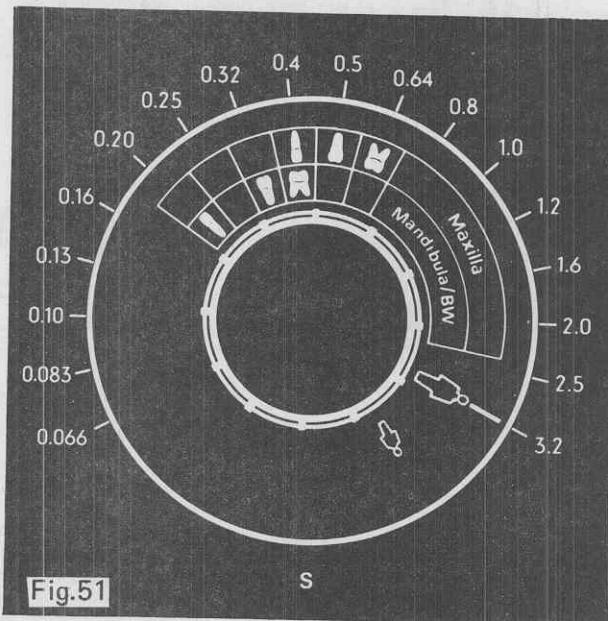


Fig.51

To calculate the power supply adequacy, enter below the measured values, starting with the no load voltage.

NO LOAD VOLTAGE

..... V

VOLTAGE UNDER LOAD

..... V

VOLTAGE DROP

..... V

The maximum permissible VOLTAGE DROP must not exceed 6,0 V in the exposure range given. In the event, that the power is insufficient an adequate power supply must be found.

Tube current

Remove the 9–10 jumper from Circuit Board D 1.

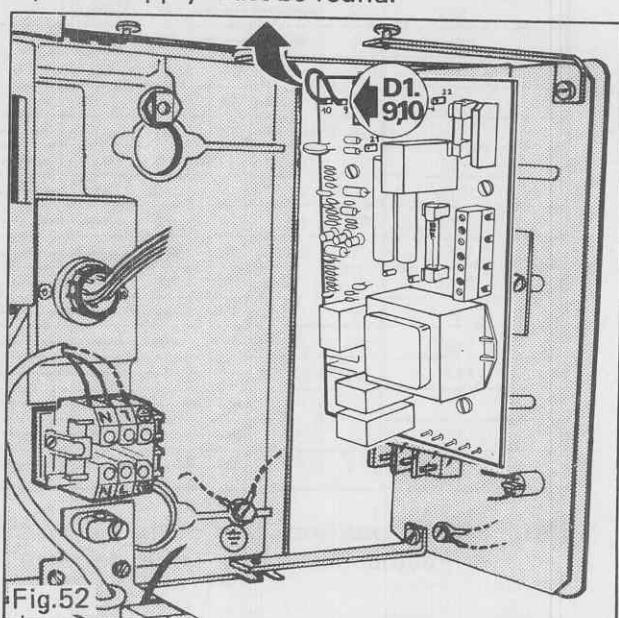


Fig.52

Connect the multimeter to D 1.9 - 10  
Select DCmA range (10 DCmA).  
Set 2,0 sec. on the time selector

Make an exposure.

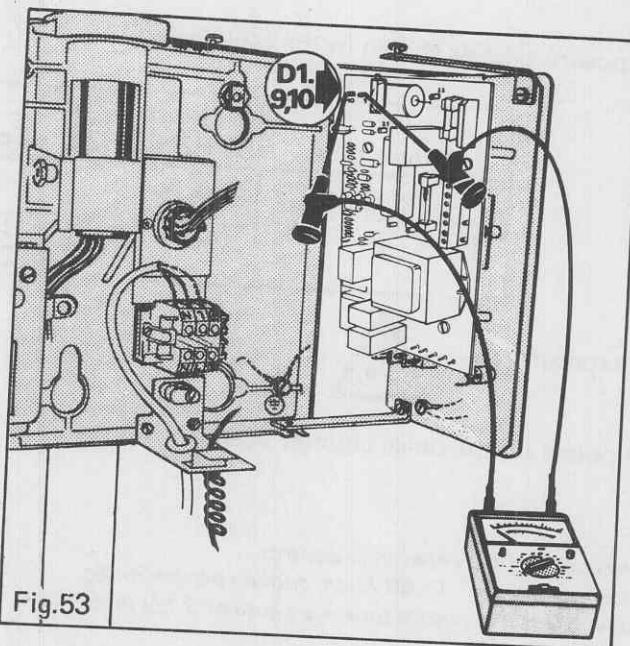


Fig.53

The buzzer must sound and the red radiation light on the front panel must light up.  
Note the mA value on the instrument.

The reading should be 7 DCmA (tolerance + 1,2 DCmA – 2 DCmA 60 HZ /  
+1,0 DCmA – 2,5 DCmA 50 HZ)

The exposure must be terminated at once if the exposure button is prematurely released (deadman feature).

Disconnect the instrument.

Reinstall the jumper 9 - 10 on circuit board D1.

#### Exposure time

The exposure time must be checked with a mechanical counter or equivalent.  
The counter is connected as described below.

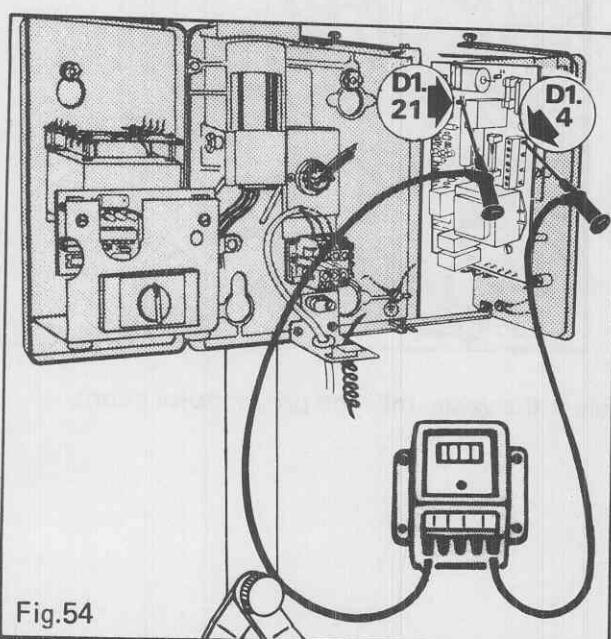
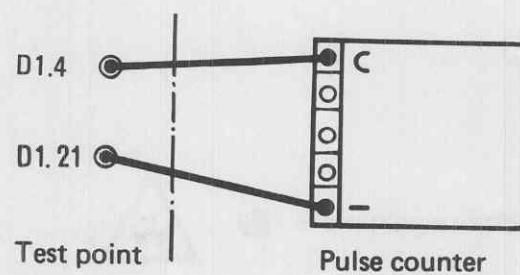


Fig.54



Test point

Pulse counter

Set the exposure time as shown in the table below.

Exposure time	Pulses		Tolerance
	50 HZ	60 HZ	
0.066 sec.	3	4	+ 1 pulse - 2 pulses
3,2 sec.	160	192	+ 10 pulses - 20 pulses

Make an exposure



Note the pulses on the pulse counter used.

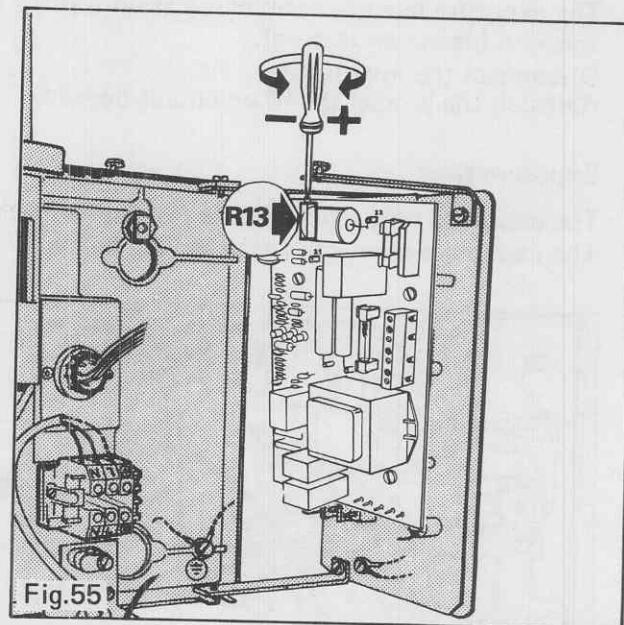
**Caution:**

*Observe the cooling time between exposures.*

*Relative power duration: 1 : 60 / min. cooling period 20 sec.  
For example, 3,2 sec. exposure time – a pause of 3 1/2 min.*

If the measured pulse count does not agree with the data as indicated, adjust as follows:

Make an exposure.



With potentiometer R13 on the circuit board D1, adjust the value until the proper pulse count is obtained.

(+) = Increase the exposure time

(-) = Decrease the exposure time

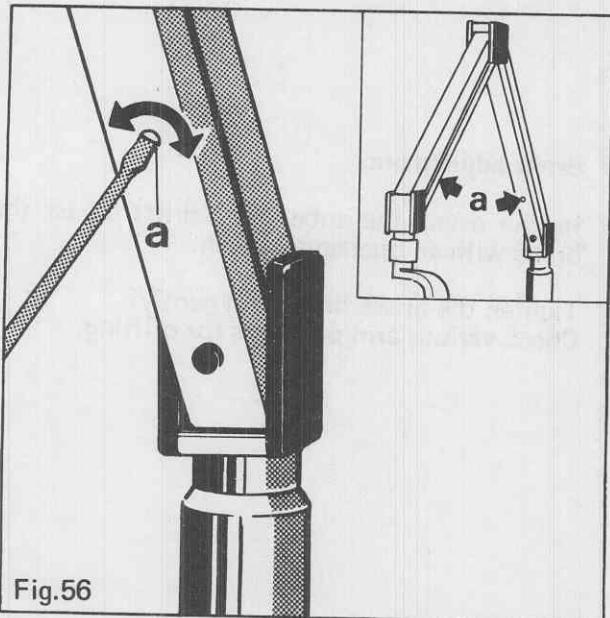


Fig.56

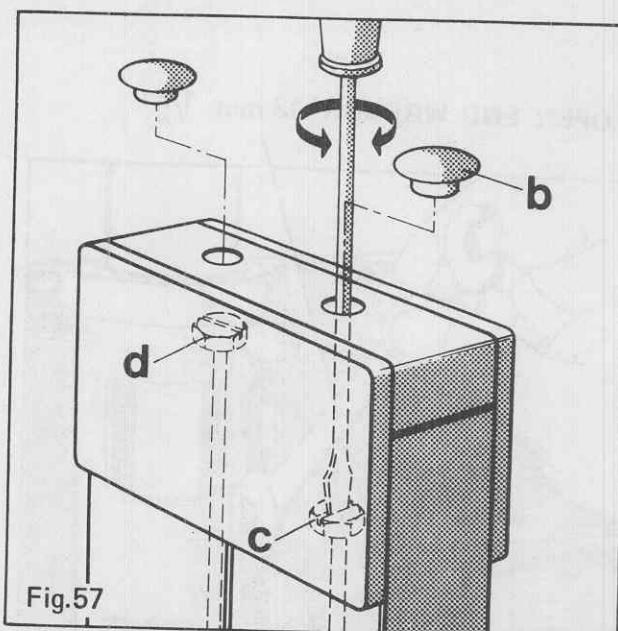


Fig.57

#### Mechanical adjustments (if required)

##### 1. Spring adjustment

Adjustment Possibility of the spring counter poise.

The spring counter poise is set at the factory. However, it is possible to make readjustments after installation at the customer's facilities. Loosen screws (a) by turning (1 1/2 turns max.). The two spring adjustment screws (c,d) are accessible at the double joint when the folded arm is in a vertical position and after removal of the caps (b). One of the screws heads is lower but is accessible with a medium size screwdriver held in vertical position. Clockwise movement increases the spring tension. Finally tighten screws (a) again.

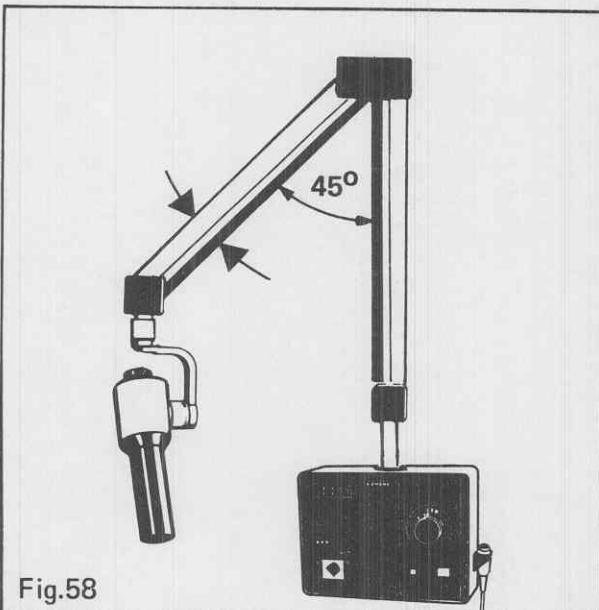
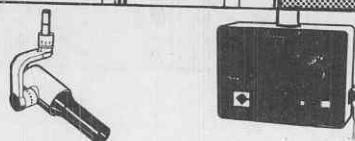


Fig.58

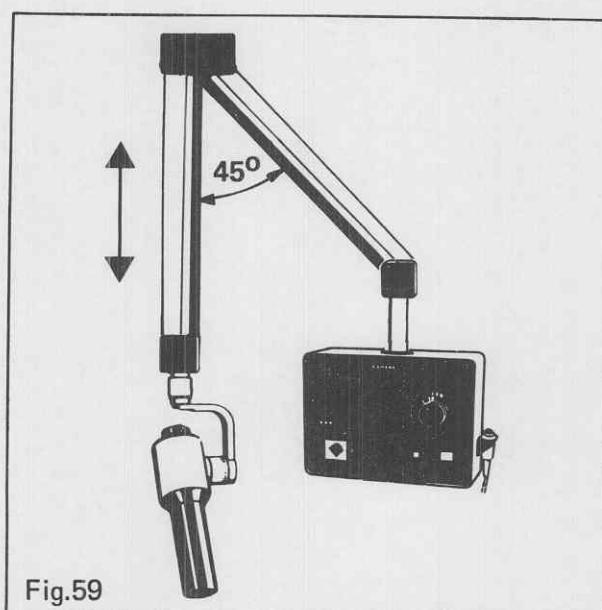


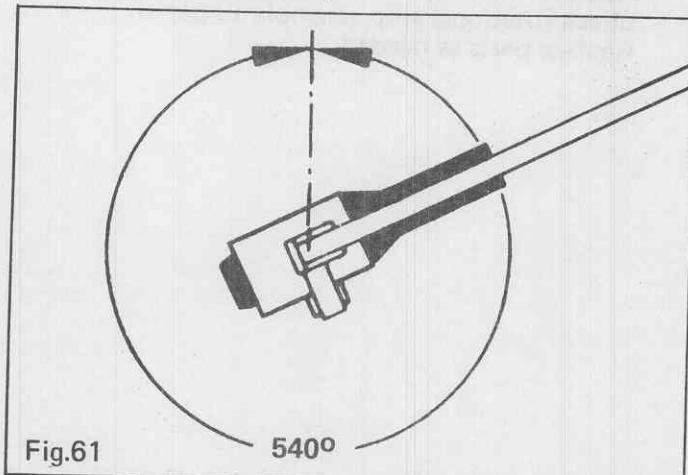
Fig.59

##### 2. Friction pad

The adjustment sequence is: loosen screw (a) of arm to be adjusted (1 1/2 turns). Position the X-ray head in a 45° angle to the vertical scissor arm. The arm with the X-ray head shall remain stationary at a 45° angle as shown. When lowering the X-ray head (to less than 45°) the X-ray head must return to 45° angle by itself when released. Spring adjustment is made with screw (d).

When raising the X-ray head (to more than 45°) the X-ray head must return again by itself when released. Spring adjustment is made with screw (c).

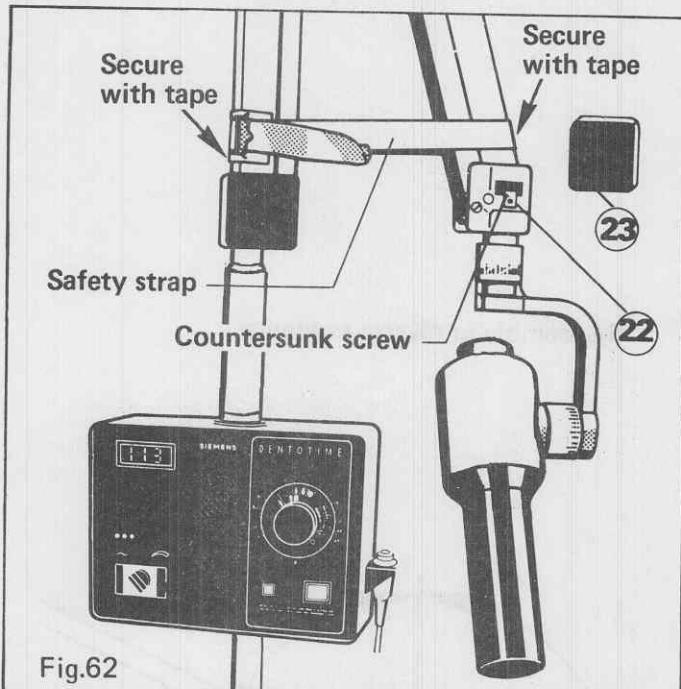
### Tube head rotational stop



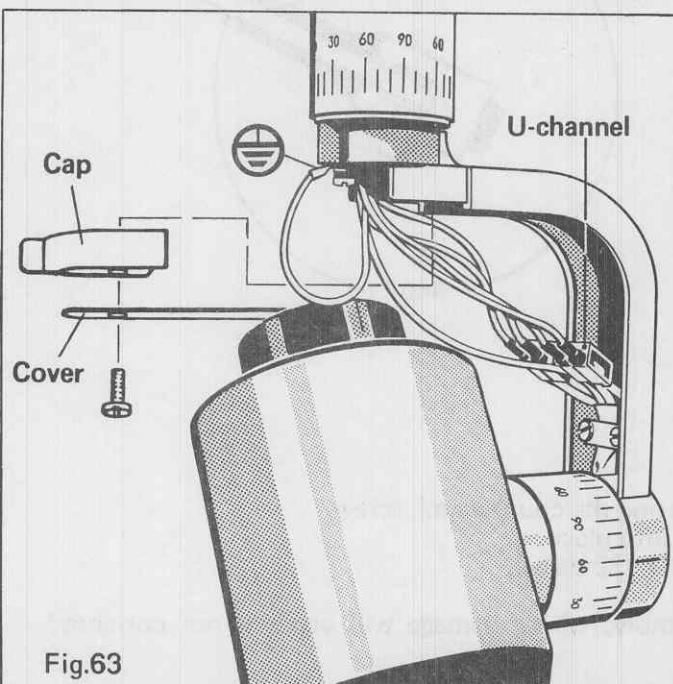
Test the tube head rotation from stop to stop for 540° (1 1/2 turns).

Rotational parts may require replacement.

To inspect, remove X-ray head from scissor arm as follows:



To facilitate the removal of the X-ray head, the scissor arm must be secured with the safety strap as shown.



**Remove cap and cover.**

Disconnect wires in the U-channel and ground wire  $\oplus$ .  
**CAUTION:**

The wires must be marked as follows:

X-ray tube assembly wires	3	4	5	6
Scissor arm wires	3	4	5	6

Remove cover (23).

Remove countersunk screw from bracket (22). Hold X-ray head at the yoke and remove bracket (22). Remove X-ray head.

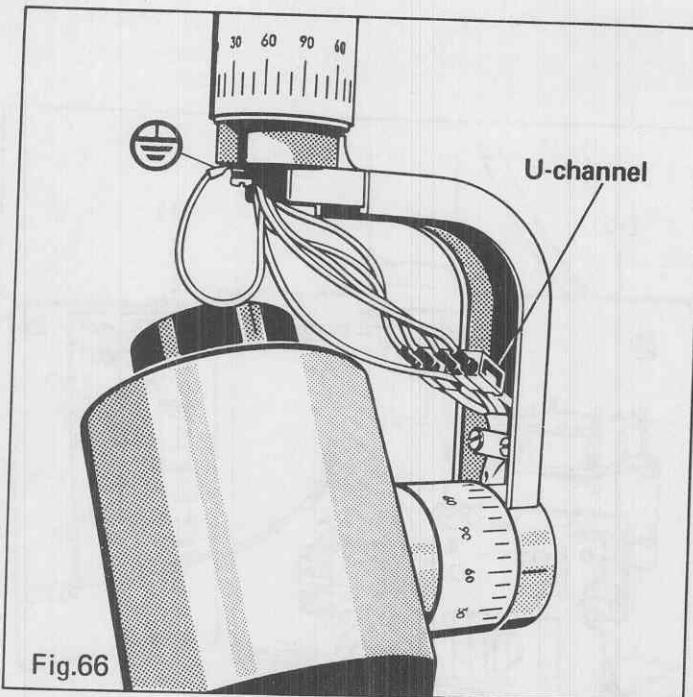


Fig.66

Connect the five wires of the X-ray tube assembly to the wires of the scissor arm according to the markings.

X-ray tube assembly wires	3	4	5	6
Scissor arm wires	3	4	5	6

#### Ground Connections

Connect the leads as shown and secure

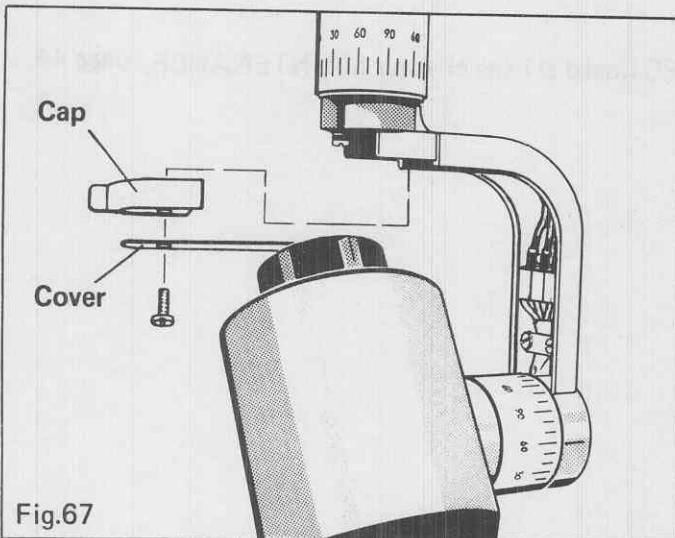


Fig.67

Press in U-channel

Place cap on yoke TAKE CARE NOT TO PINCH ELECTRICAL WIRES

Place cover over yoke and fasten with screw.

Wiring exchange in scissor arm: WE DO NOT RECOMMEND a field repair.  
Defective scissor arms shall be returned to SIEMENS MEDICAL SYSTEMS, INC. Dental X-Ray Division  
(address see rear)

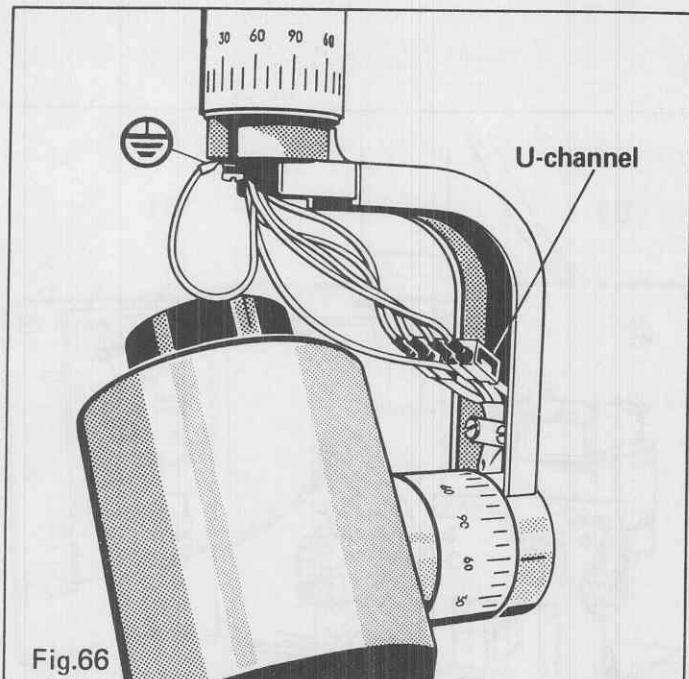


Fig.66

Connect the five wires of the X-ray tube assembly to the wires of the scissor arm according to the markings.

X-ray tube assembly wires	3	4	5	6
Scissor arm wires	3	4	5	6

#### Ground Connections

Connect the leads as shown and secure

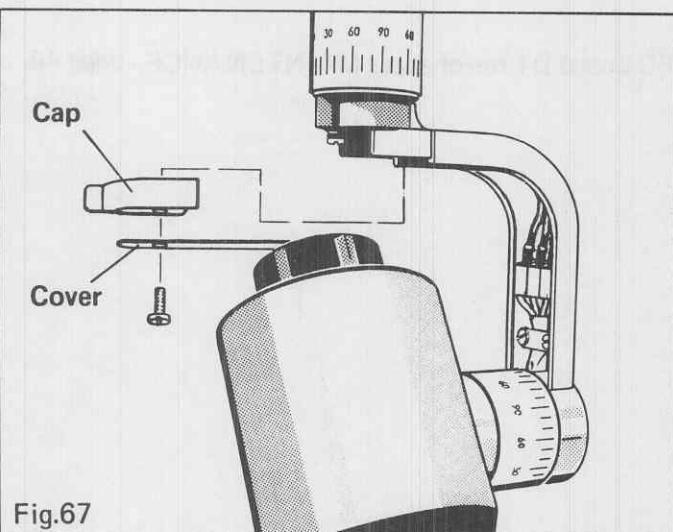


Fig.67

Press in U-channel

Place cap on yoke TAKE CARE NOT TO PINCH ELECTRICAL WIRES

Place cover over yoke and fasten with screw.

Wiring exchange in scissor arm: WE DO NOT RECOMMEND a field repair.  
Defective scissor arms shall be returned to SIEMENS MEDICAL SYSTEMS, INC. Dental X-Ray Division  
(address see rear)

## Exchange of PC boards

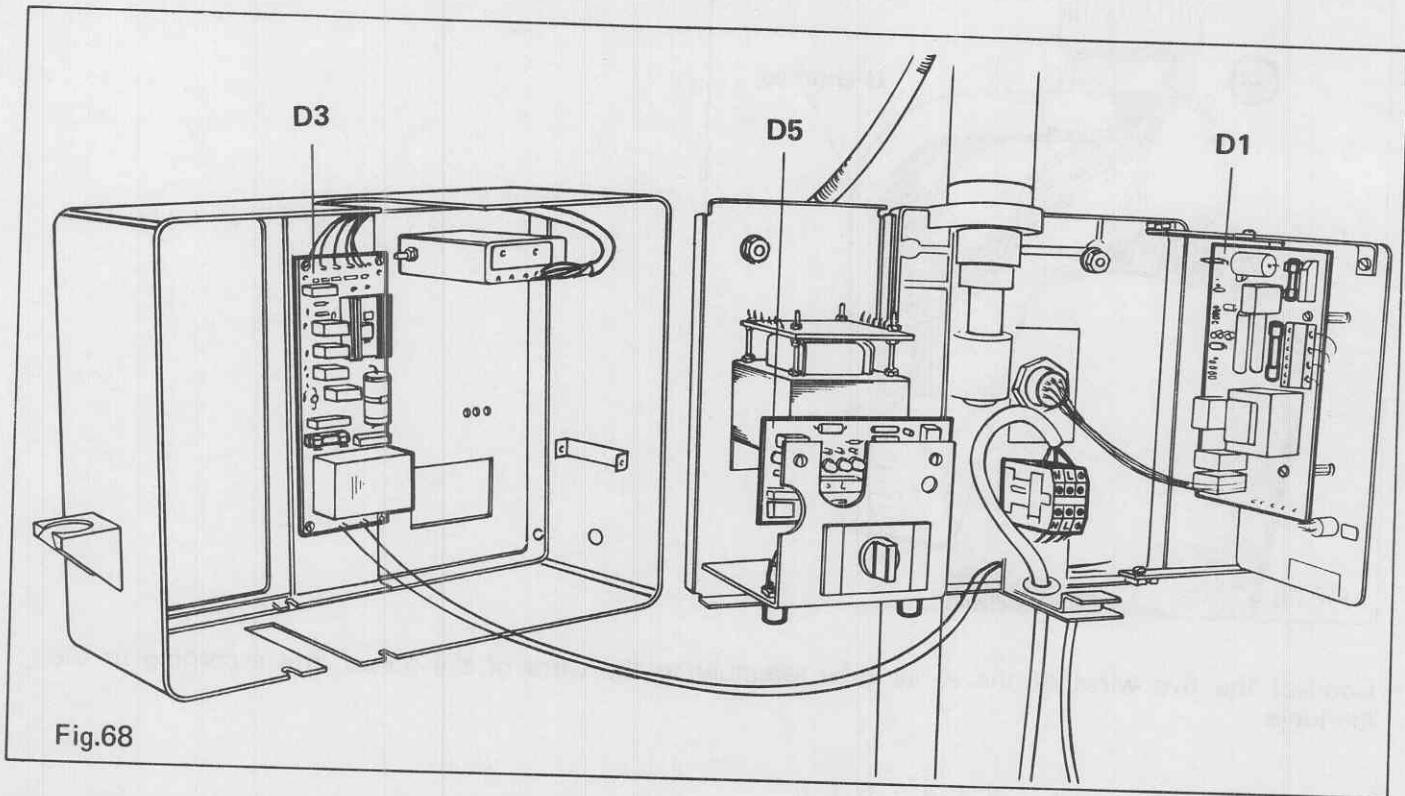


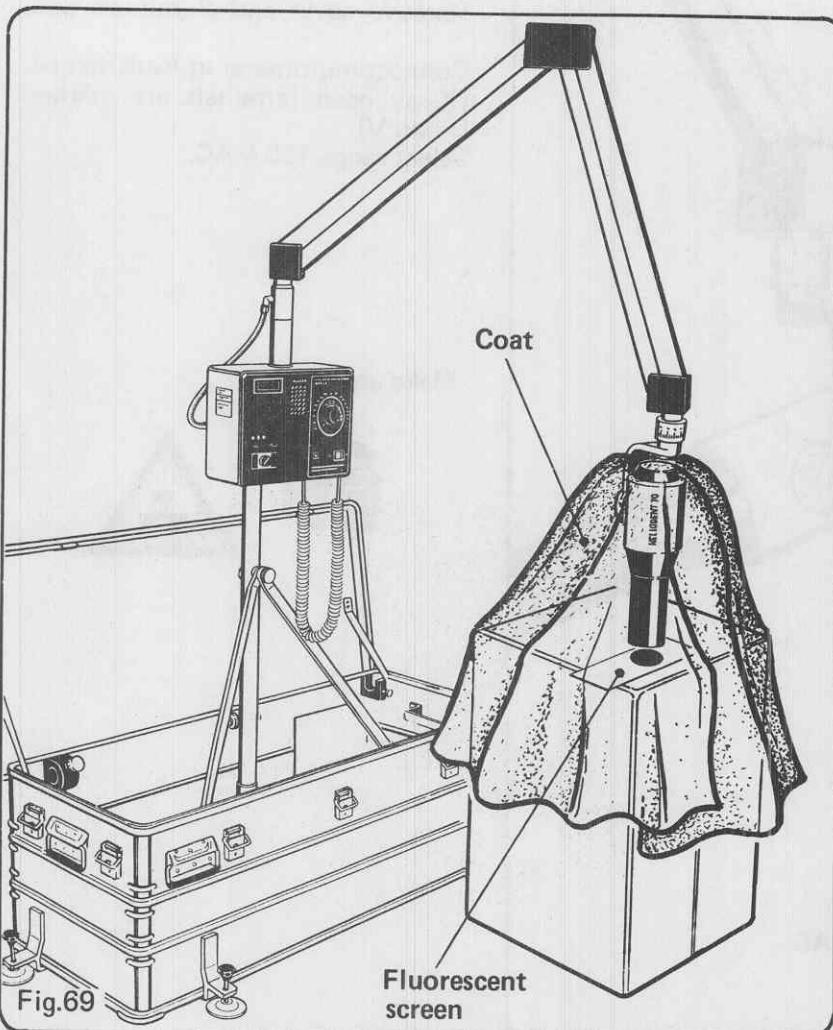
Fig.68

PC boards D1 and D3 may be exchanged with the aid of a screw driver.  
PC board D5 requires a soldering tool.

All PC boards are factory calibrated. For adjustment of PC board D1 see chapter MAINTENANCE, page 44.

No X-rays emitted from tube head – blank radiographs

X-ray output can be checked with a fluorescent screen, if available.

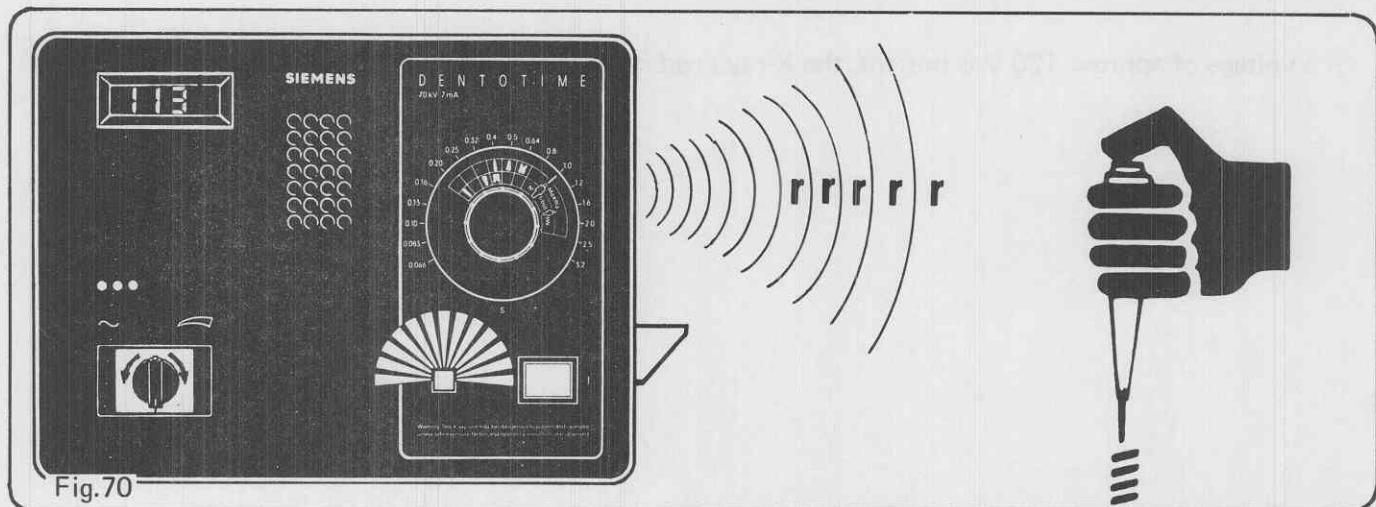


Place the fluorescent screen on a table or counter top as shown.  
Place a coat over the X-ray head in order to dim the surrounding area.  
Set exposure time 1,0 sec.

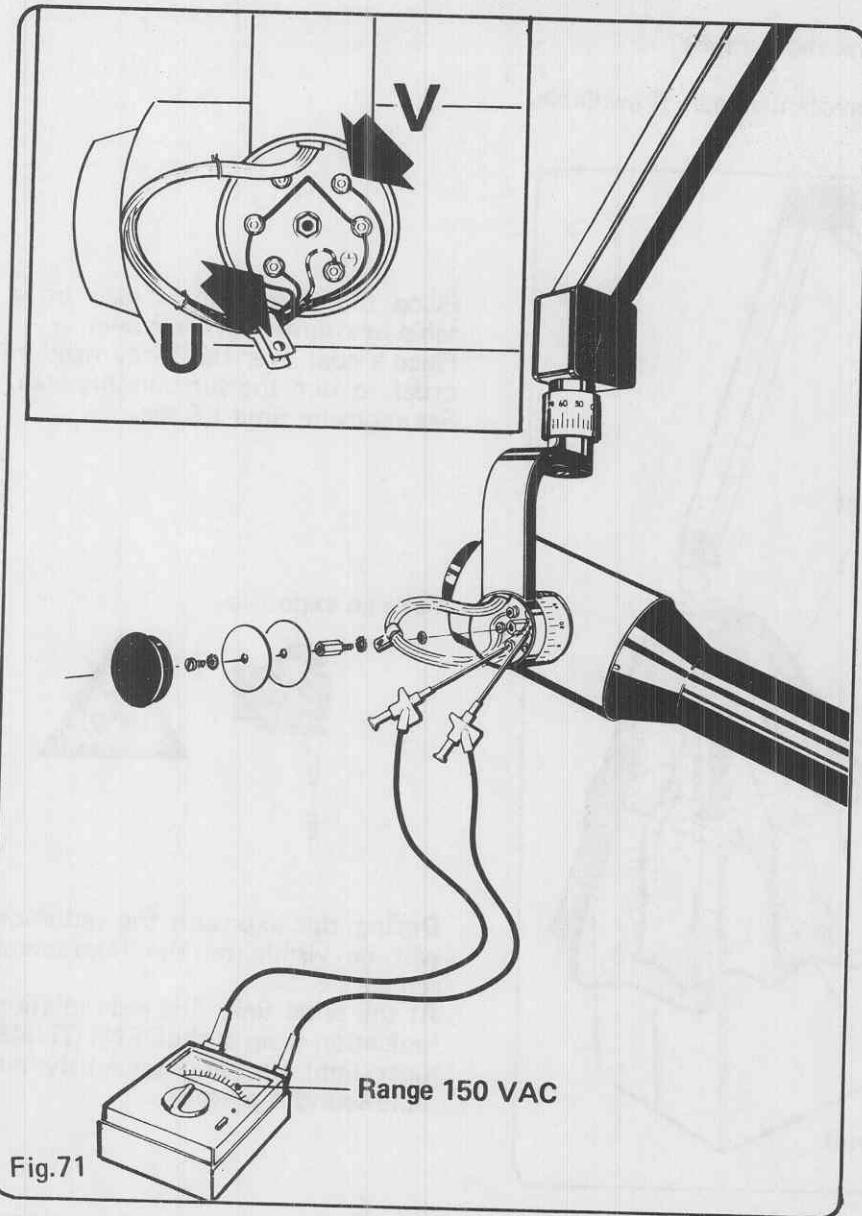
Make an exposure



During the exposure the radiation will be visible on the fluorescent screen.  
At the same time, the red radiation indication lamp at the DENTOTIME must light up, simultaneously audible sound is present.



If no X-rays are present but all visual and audible indicators are functional, make electrical measurement as follows.



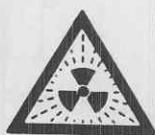
#### Electrical measurement

Remove cover and aluminum disc.

Connect multimeter at leads 3 and 4. (X-ray head terminals are marked U and V).

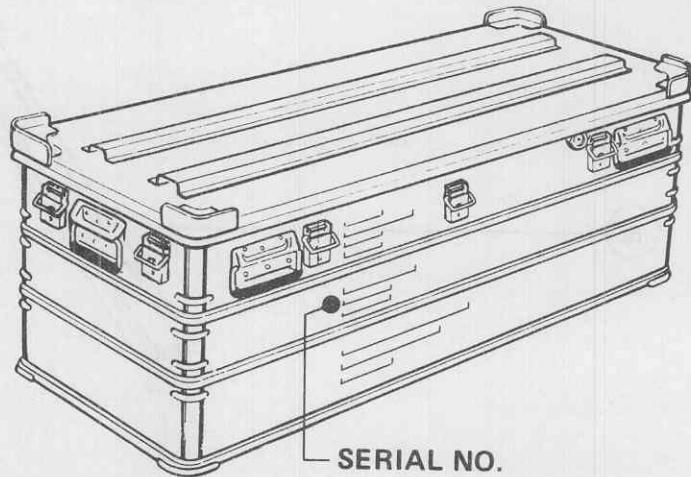
Select range 150 VAC.

#### Make an exposure



If a voltage of approx. 120 V is present, the X-ray head is defective and must be exchanged.

## STORAGE INSPECTION PROCEDURE



First inspection: 18 months after date of manufacture

Further inspections: every 12 months thereafter

UNIT's SERIAL NO.				
	Date of inspection		Inspectors name	Signature
	Month	Day		
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

**ASSEMBLY INSTRUCTIONS FOR PORTARAY - MODEL D 3152**

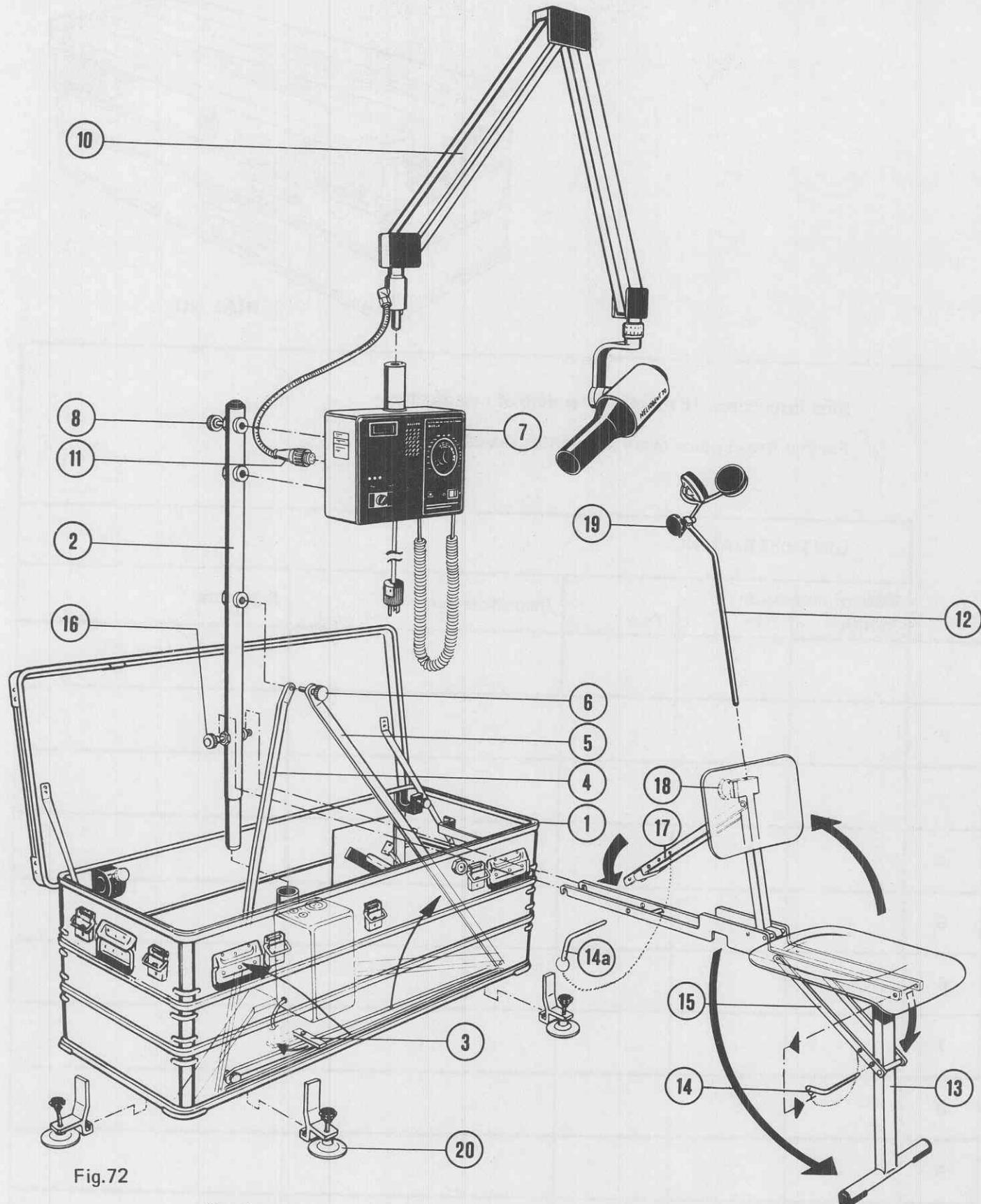


Fig.72

**Caution:**

After the completed assembly the carrying case must be leveled.

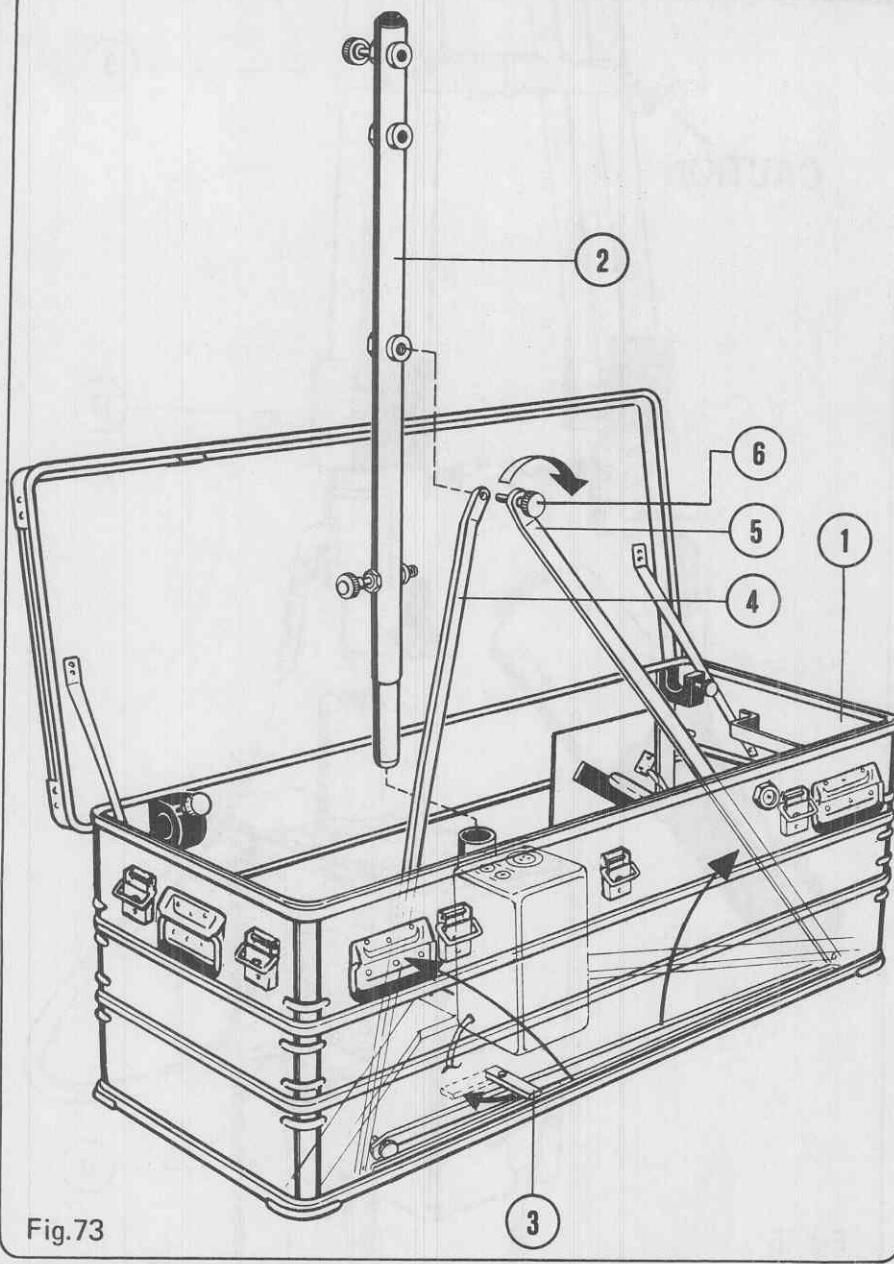
## Set-up

1

Remove all components from carrying case (1).  
Lay out components keeping numbers in sequence.

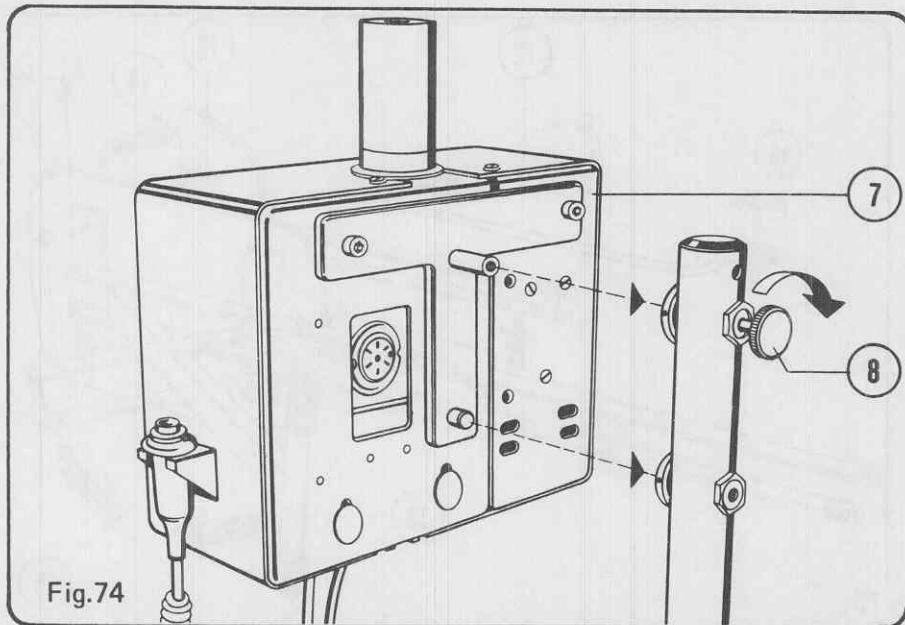
Insert upright (2) into base, swing bracket (3) in the direction of the arrow.

Lift support bars (4) and (5), secure same in upright as shown with knob (6).



2

Engage dowel pins of X-Ray control adapter (7) in upright, secure with knob (8).

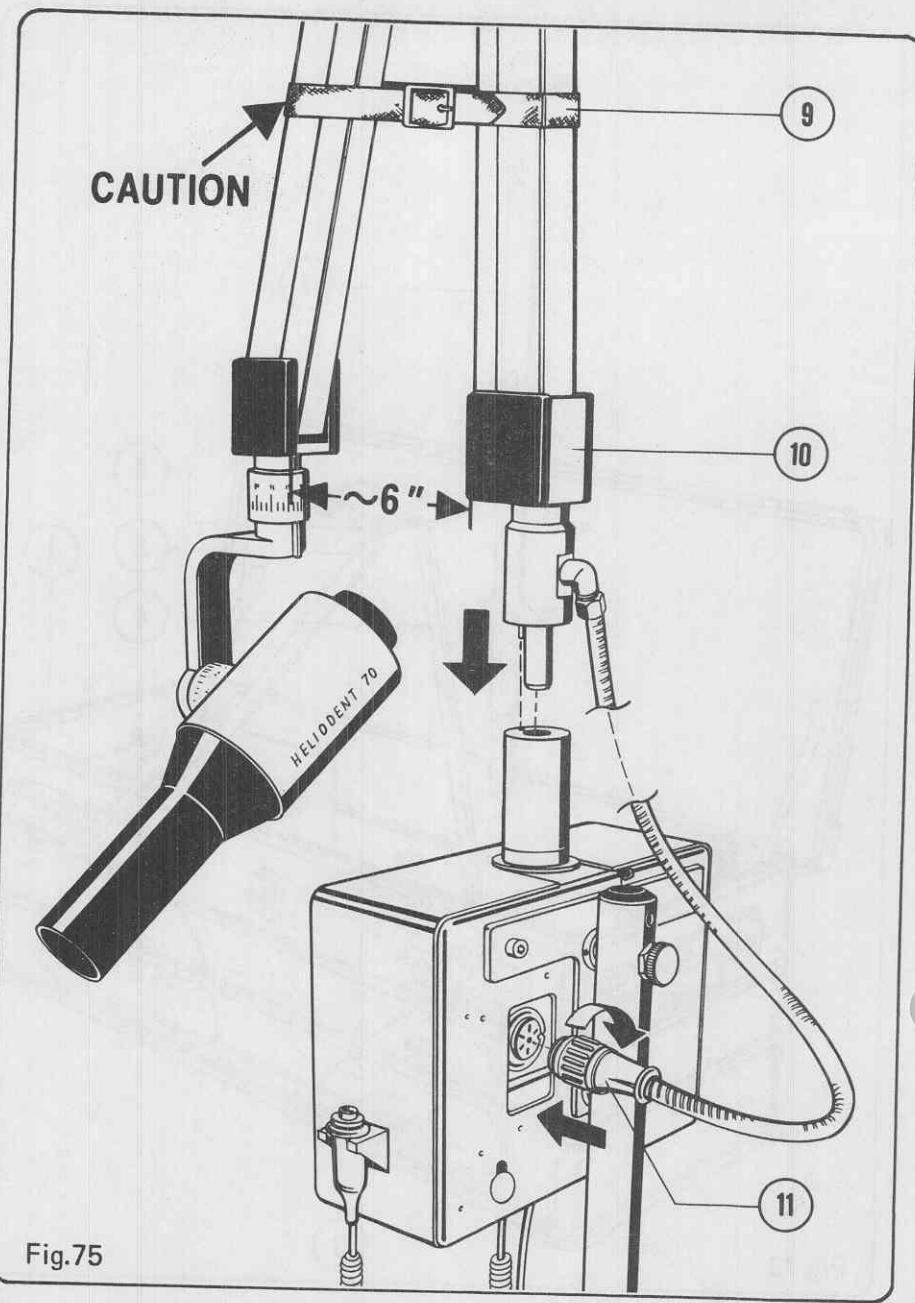


### 3

Loosen safety strap (9) to permit a 6" opening of the scissor arm (10) before engaging the arm in the coupling as shown.

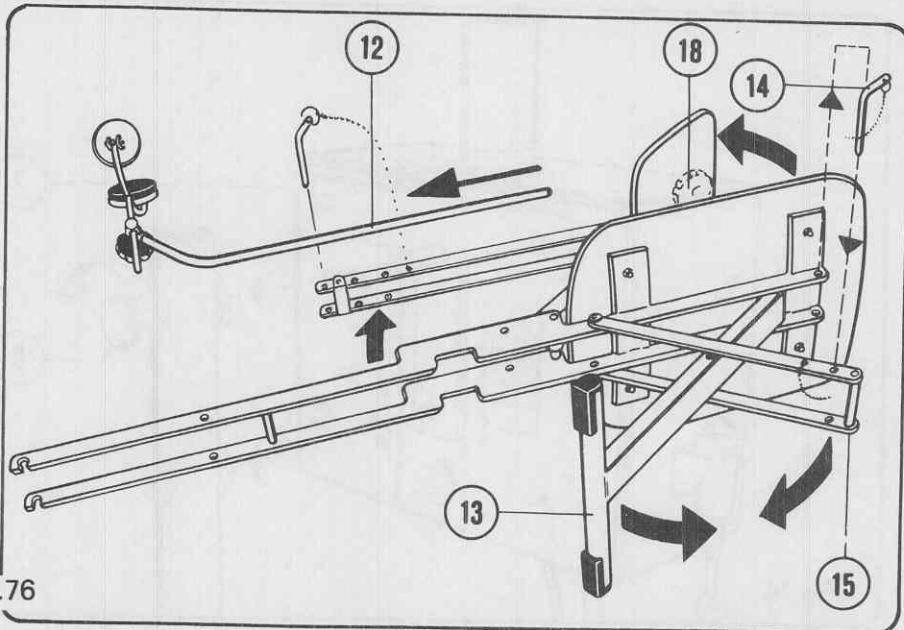
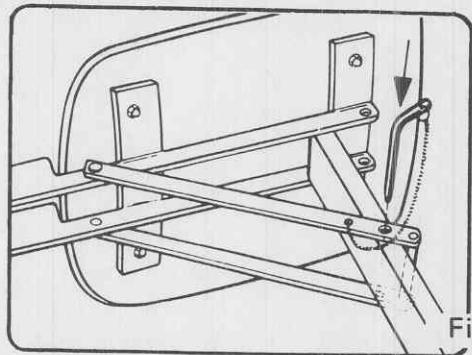
**CAUTION!** To prevent accidental opening of the spring loaded scissor arm, causing injury and arm damage. DO NOT REMOVE safety strap completely, unless the arm is fully engaged in the coupling.

Connect multi pin plug (11) secure with lock ring in direction of arrow.



### 4

Loosen knob (18), remove headrest assembly (12) from storage position. Remove safety pin (14). Unfold stool leg (13) and retainer bracket (15). With stool leg fully extended secure same with safety pin as shown see detail.



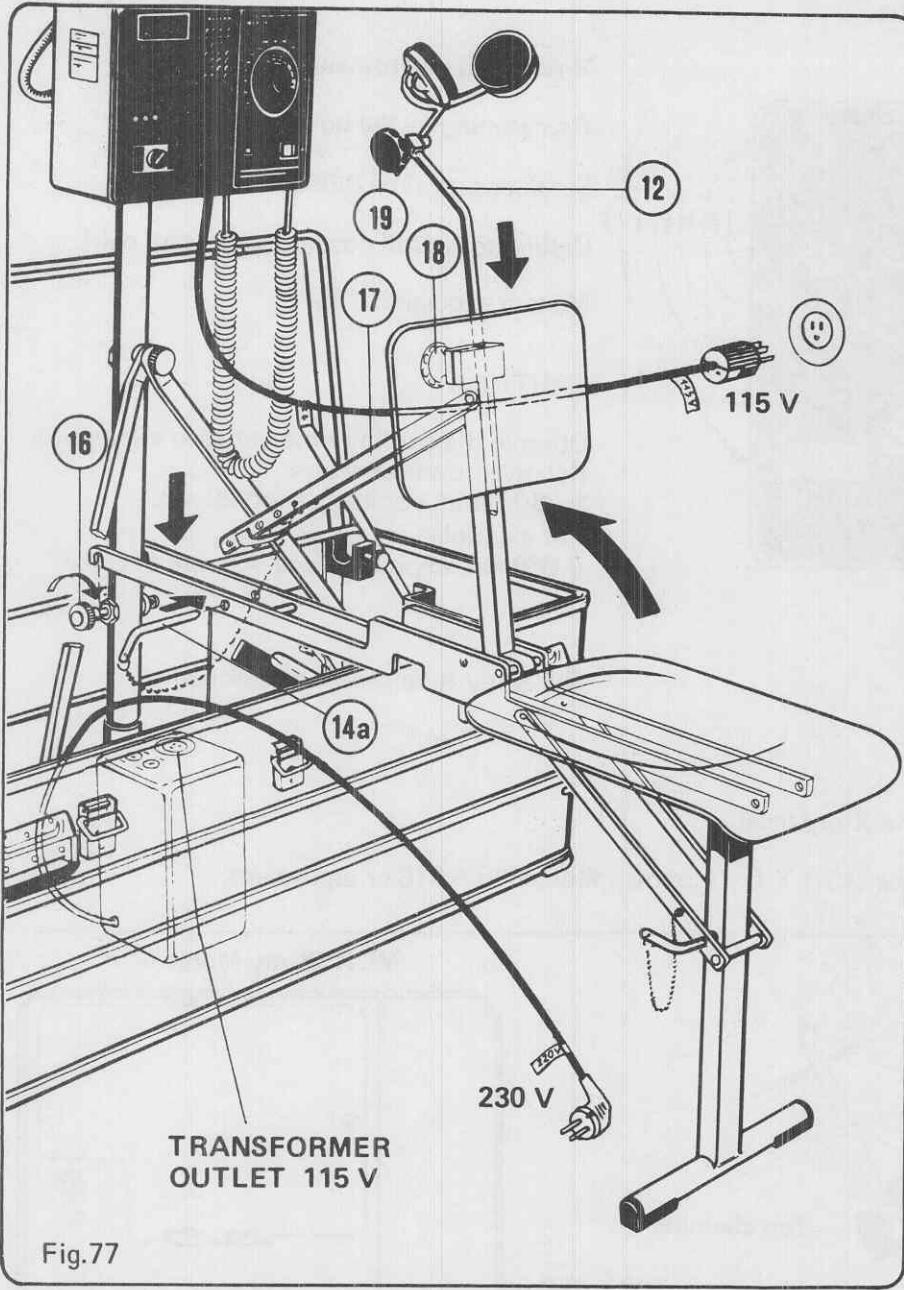


Fig.77

## 5

Engage stool support in upright, secure with knob (16). Raise backrest in direction of arrow.

Position backrest with backrest brace (17) (3 positions) and secure with safety pin (14a).

Insert headrest assembly (12), secure with knob (18) (headrest height adjustment).

Adjust headrest cradle position with knob (19).

**When the power supply is 115 V:**  
Connect the power cord directly into the 115 V wall outlet.

**When the power supply is 230 V:**  
Connect the power cord at the transformer's 115 V outlet and connect the transformer's power cord into the 230 V wall outlet.

In case of a portable gasoline-diesel driven generator this generator must meet the following technical characteristics:

Power rating: 5 kVA,

Volts: 230 V nominal, single phase

Max.permissible deviation: 207 to

253 VAC

Max. permissible fluctuation of line voltage during standby:  
1.5 % at 230 VAC.

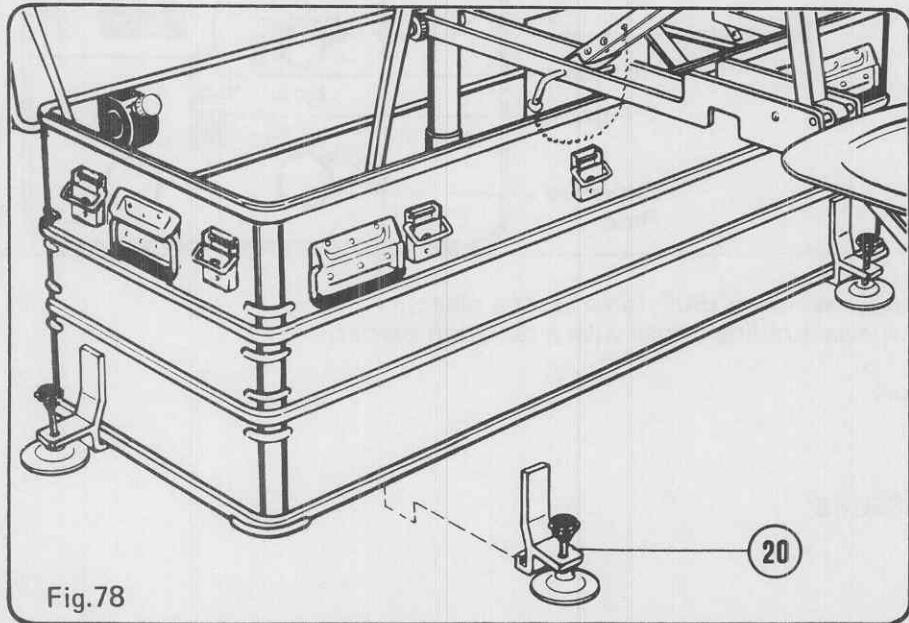


Fig.78

## 6

Level carrying case and upright with the aid of 3-leveling devices (20).

The leveling devices hook to the lower carrying case frame.

## Radiation output performance verification

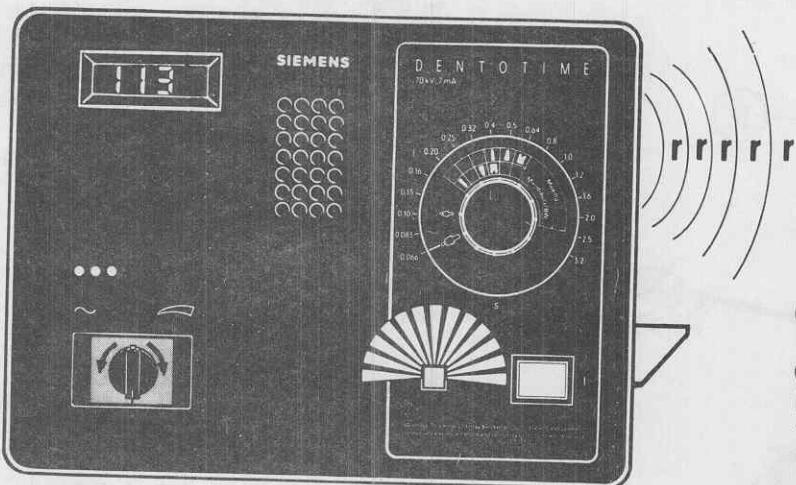


Fig.79

### X-ray head performance test

Reseasoning of the built-in X-ray tube.

Set exposure time 0.066 sec.

Collimator is still covered with lead cap!

Make 5 exposures.

### CAUTION:

Observe the cooling time between exposures.  
Relative power duration:

1 : 60 / min. cooling period 20 sec.

For example,

0.066 sec. exposure time — pause of 5 sec.

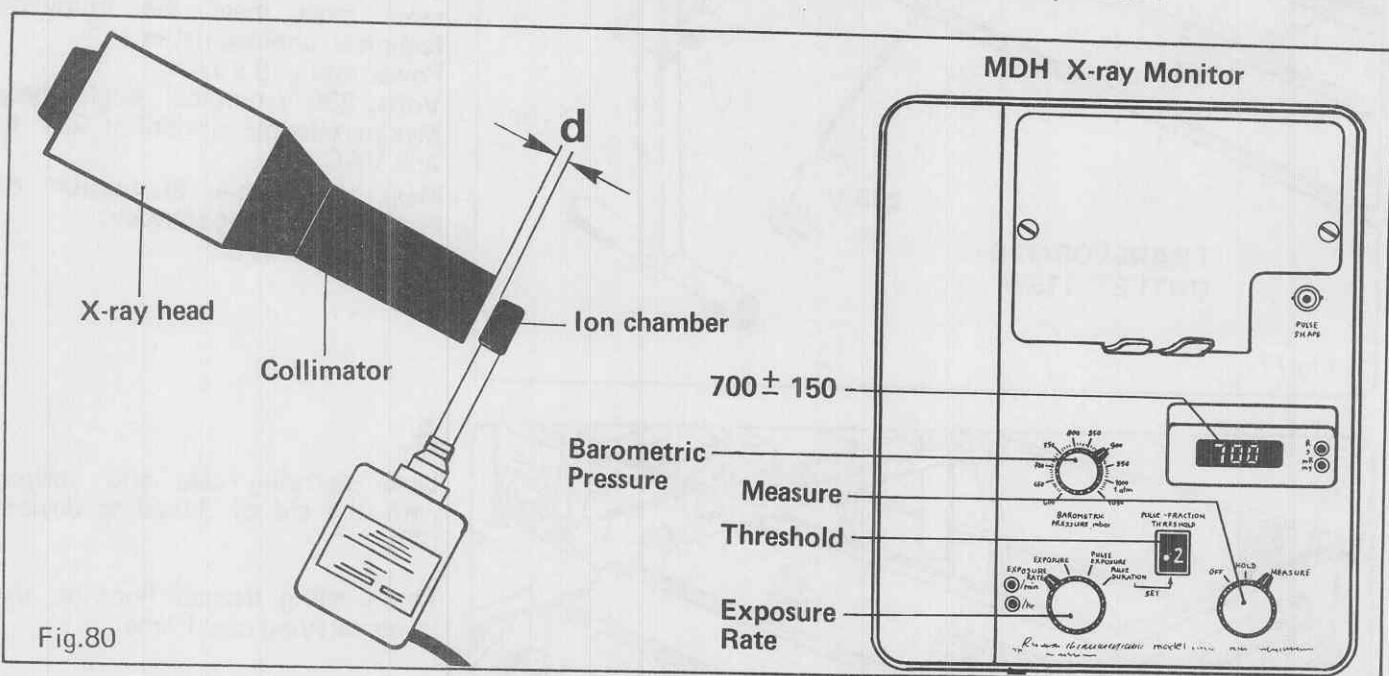
The X-ray tube is now reseasoned.

### Dose Measurement

Set exposure time 1.0 sec.

Remove lead cap from collimator of the X-ray head.

The measurement is carried out with the MDH X-ray Monitor, Model No. 1015 or equivalent.



Position the X-ray head to the ion chamber as shown (90°, same central plane).

For reproducibility we recommend a special holding device with a radiation barrier.

Adjustments to the MDH X-ray Monitor:

- Set THRESHOLD to 0.2
- Set to proper BAROMETRIC PRESSURE
- Set to EXPOSURE RATE
- Set to MEASURE

Make an exposure



**WARNING:  
RADIATION!**

The measured dose should be 700 mR plus minus 150 mR.

For reproducability note the distance , where the measured dose value is obtained. Distance d: .....

In the event the dose levels are lower than specified above, the X-ray head needs to be replaced.

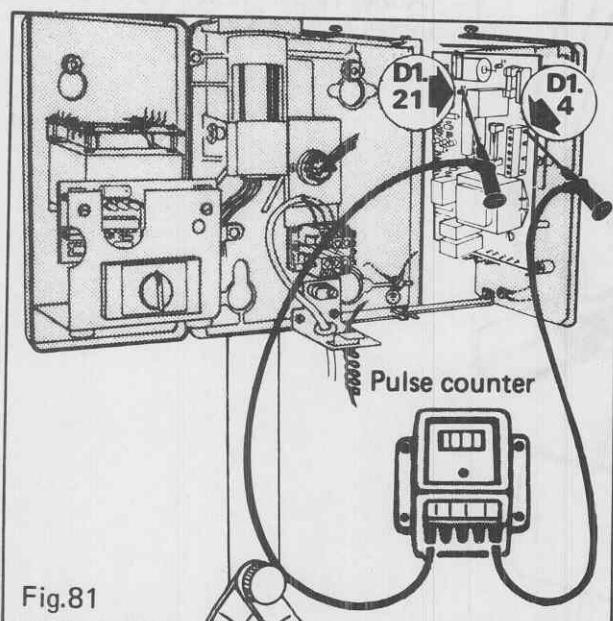


Fig.81

**Checking the exposure time**

Pulse counter Model - KESSLER ELLIS KT  
 $203 \pm 1$  pulse.

Connect pulse counter as shown.  
Set exposure time 0.066 sec.

Make four exposures



**CAUTION:** Observe the cooling time between exposures.

Relative power duration:

1 : 60 / min., cooling period 20 sec.

For example:

0.066 sec. exposure time — pause of 5 sec.

3.2 sec. exposure time — pause of 3 1/2 min.

Note the values:

1. \_\_\_\_\_ pulses
2. \_\_\_\_\_ pulses
3. \_\_\_\_\_ pulses
4. \_\_\_\_\_ pulses

Total \_\_\_\_\_ and divide by 4 = \_\_\_\_\_

If the average pulse count is not within: 1 to 4 pulses at 50 Hz

2 to 5 pulses at 60 Hz see MAINTENANCE, page 44.

**ATTENTION! Installer/Assembler**

Measurements followed by this symbol must be recorded on the QA Installer Check-list!



Set exposure time 3.2 sec.

Make four exposures



Note the values:

1. \_\_\_\_\_ pulses
2. \_\_\_\_\_ pulses
3. \_\_\_\_\_ pulses
4. \_\_\_\_\_ pulses

Total \_\_\_\_\_ and divide by 4 = \_\_\_\_\_

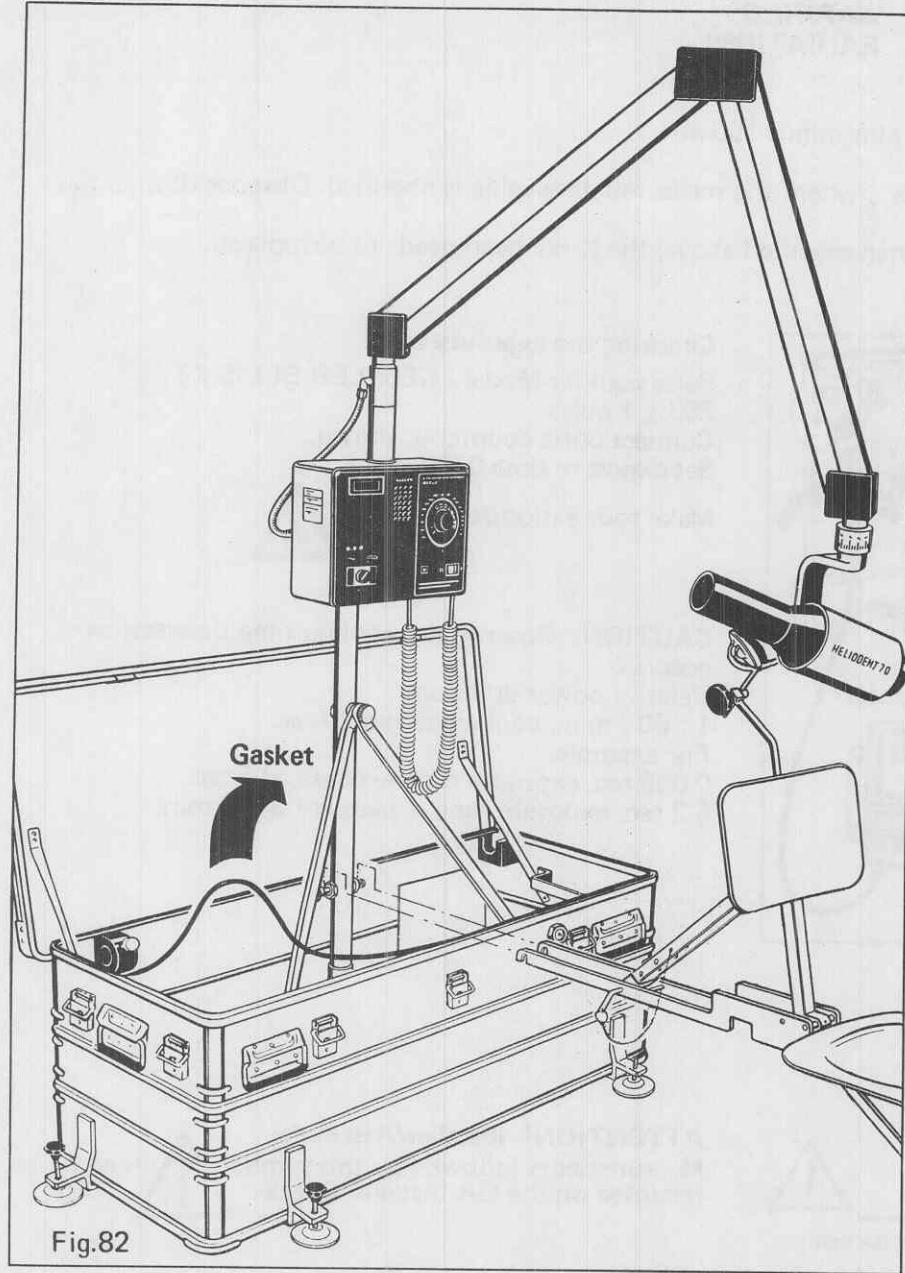
**ATTENTION! Installer/Assembler**

Measurements followed by this symbol must be recorded on the QA Installer Check-list!



If the average pulse count is not within: 140 to 170 pulses at 50 Hz

172 to 202 pulses at 60 Hz see MAINTENANCE, page 44.



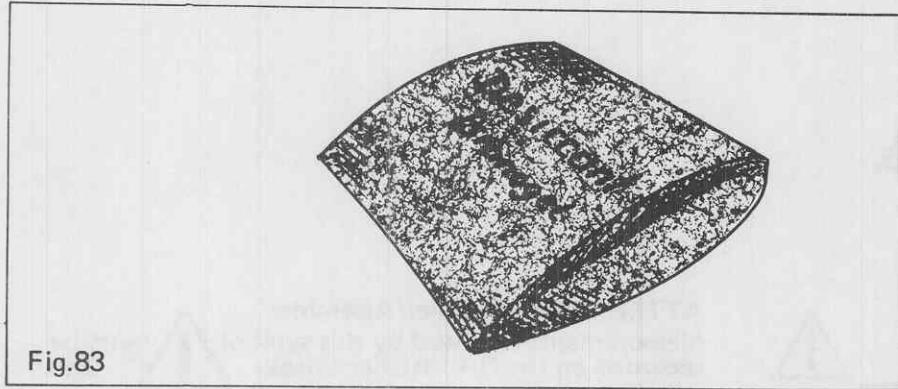
### Inspection of the gasket

If a mechanical defect (cuts, frayed etc.) is visible, the gasket must be exchanged.

Remove old gasket and clean the gasket retainer groove with a scraper to remove old adhesive.

Apply new adhesive per manufacturers instruction.

(Adhesive part no.29 78 195 D 3152).  
Install new gasket.



### Desiccant bag (Branogel).

The desiccant bag must be exchanged every year.

The desiccant bag in the storage packaging has a color indicator:  
color blue means "good",  
color pink means "not good".

## Rerepacking

Disconnect unit from power supply

1

Remove X-Ray Arm assembly (10) first!!

Place safety strap over scissor arm as shown.

**CAUTION!** Failure to follow this procedure may cause injury, and/or damage to the scissor arm (the arm is spring loaded).

Loosen locking ring, disconnect multi pin connector, disengage scissor arm assembly from coupling as shown, place protective sleeve (23) over multi pin connector (11), route greenfield tubing tighten strap (9).

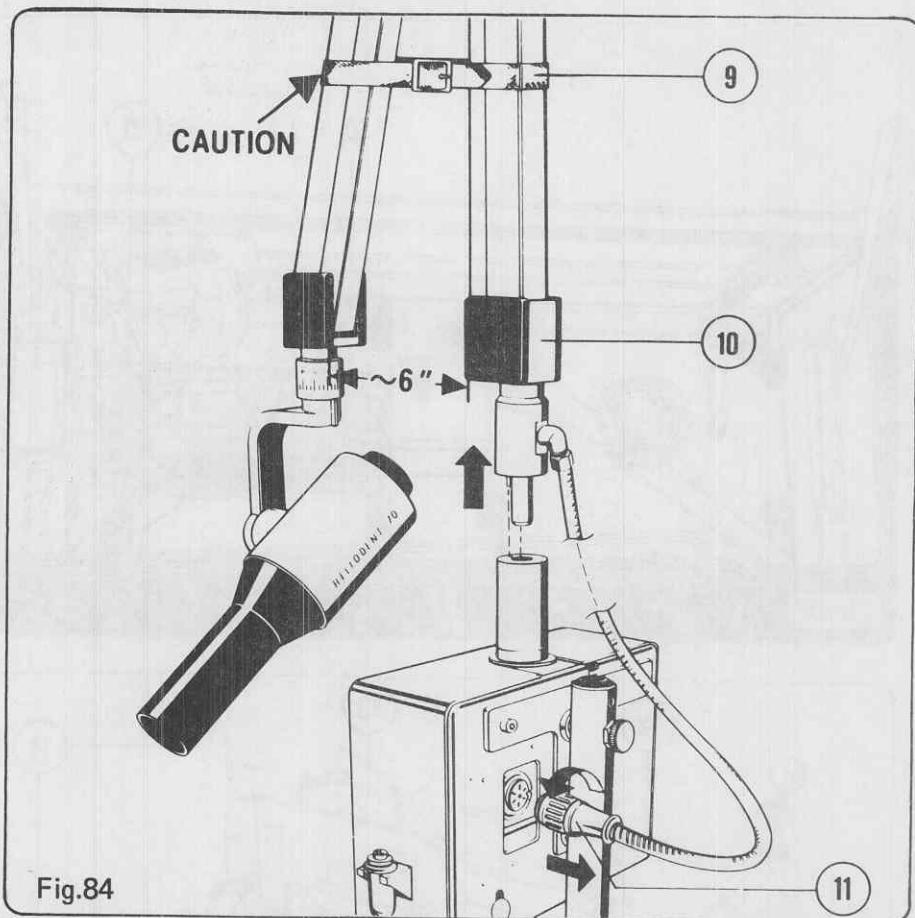


Fig.84

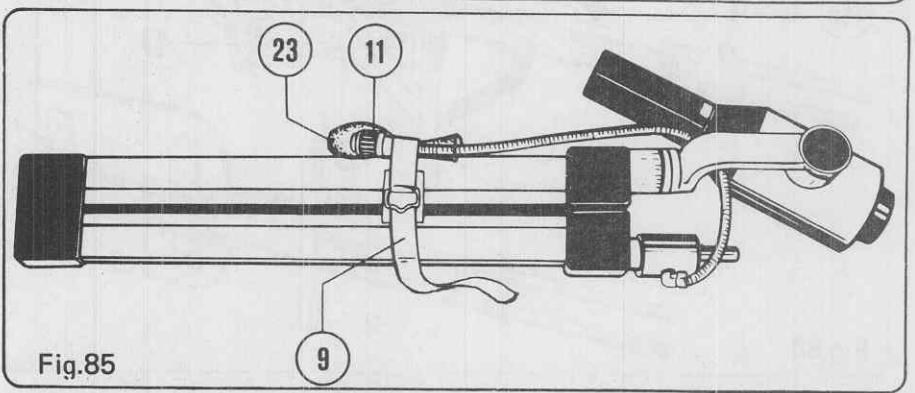


Fig.85

Remove all other components.

Fold support bars (4) and (5), secure with bracket (3) in the direction of arrow.

Store leveling brackets (20) as shown and secure.

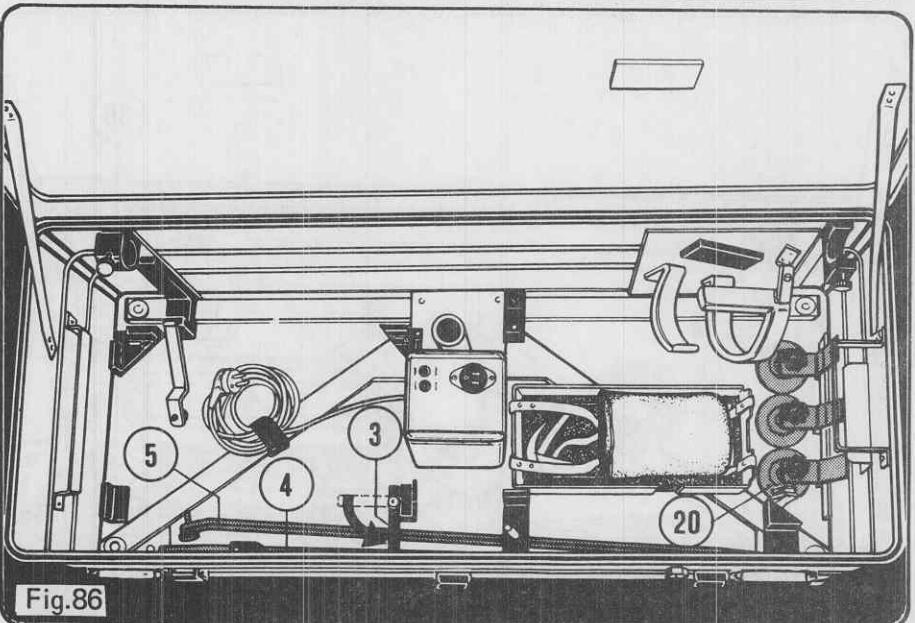


Fig.86

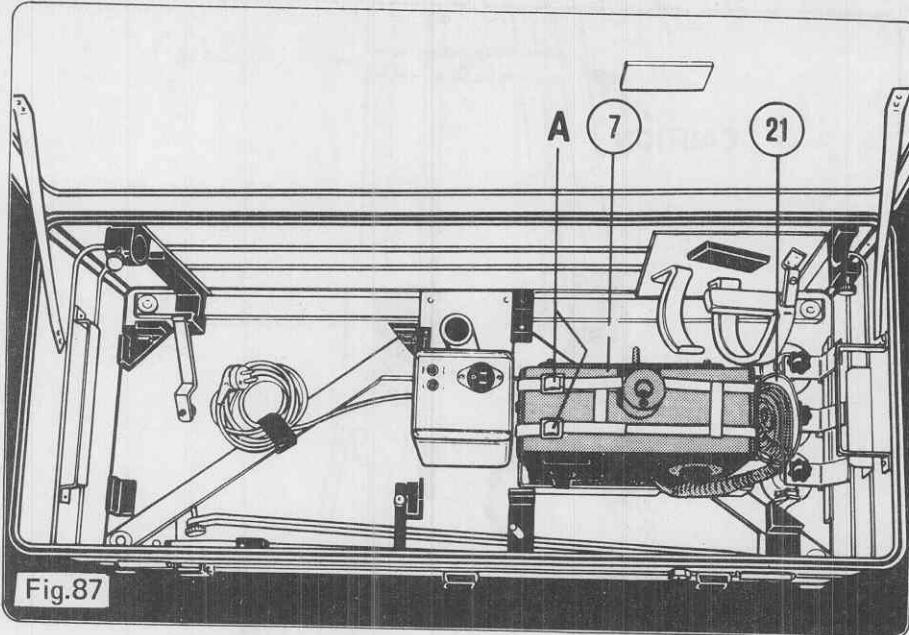


Fig.87

**2**

Place X-Ray control (7) into cradle, store power cord and exposure cord in pouch (21) . Secure control as shown (A).

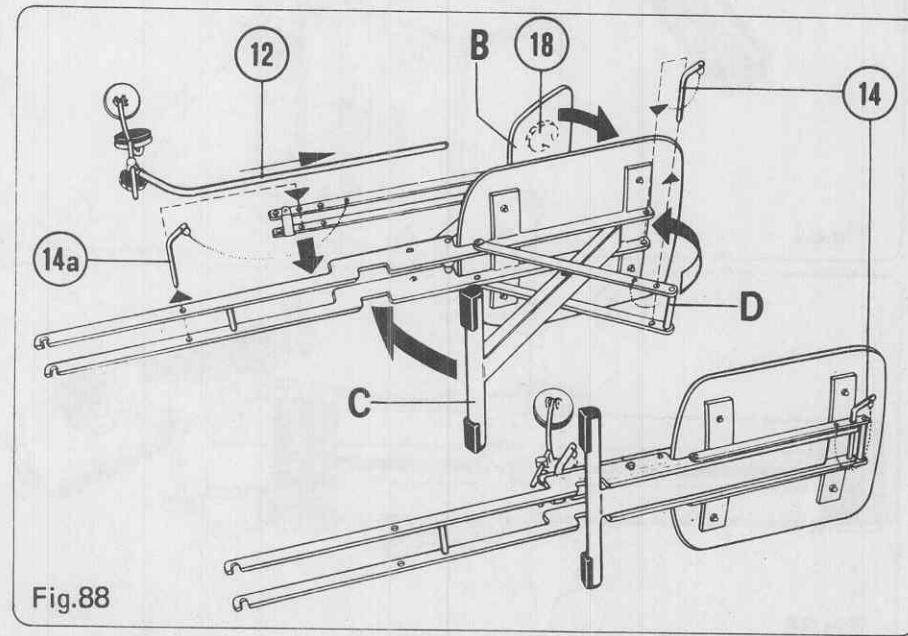


Fig.88

**3**

Remove headrest assembly (12). Remove pin (14a) and store in backrest brace.

Fold backrest (B). Insert headrest assembly (12) in the direction of arrow, secure with knob (18).

Remove safety pin (14) , fold stool leg (C) and retainer bracket (D), secure with safety pin as shown.

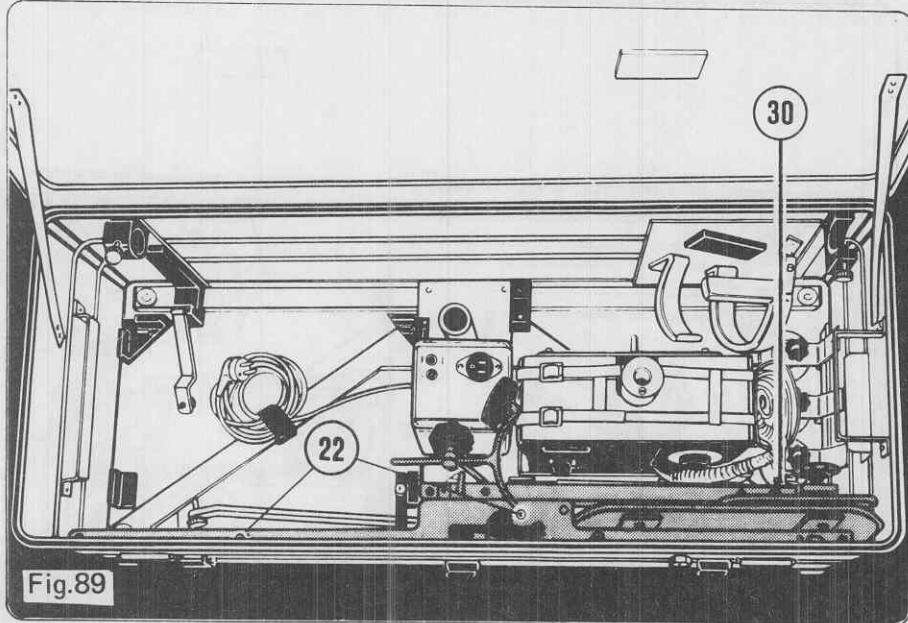
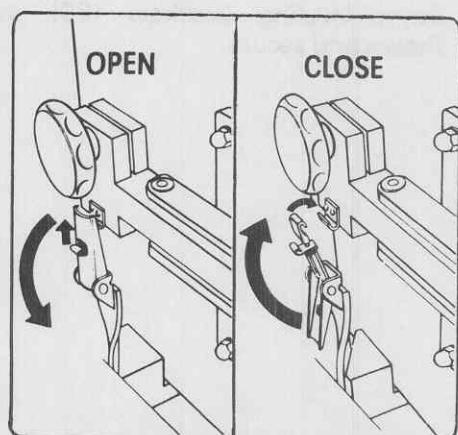


Fig.89

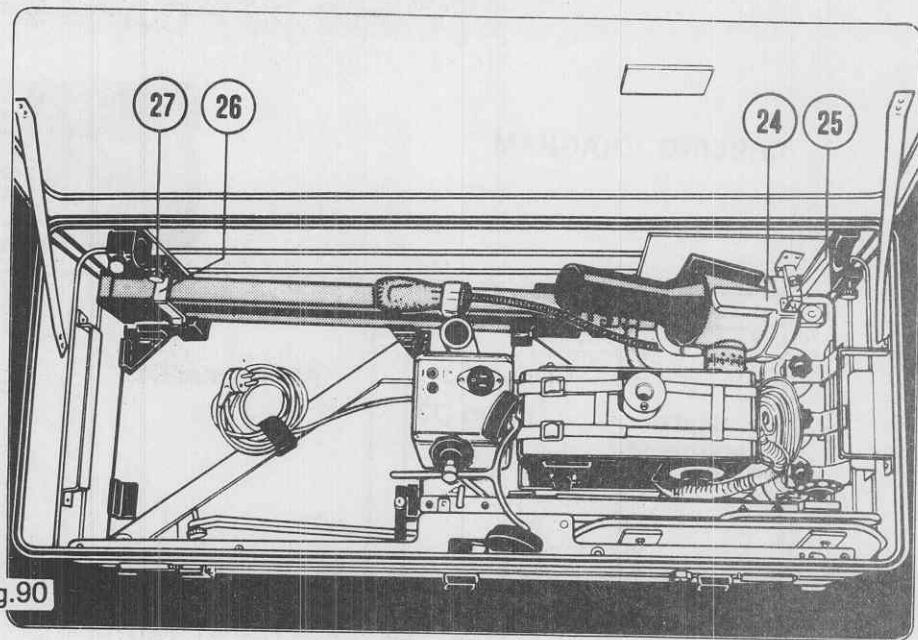
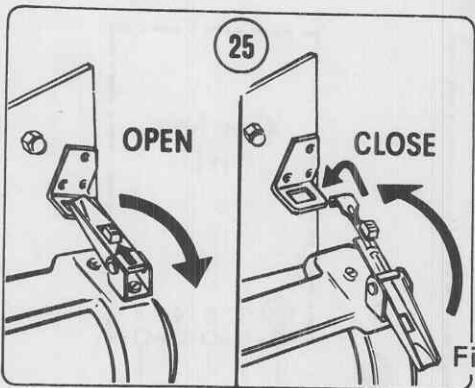
**4**

Place stool assembly into case, watch for dowel pins (22) to engage as shown. Secure (CLOSE) with fastener (30).



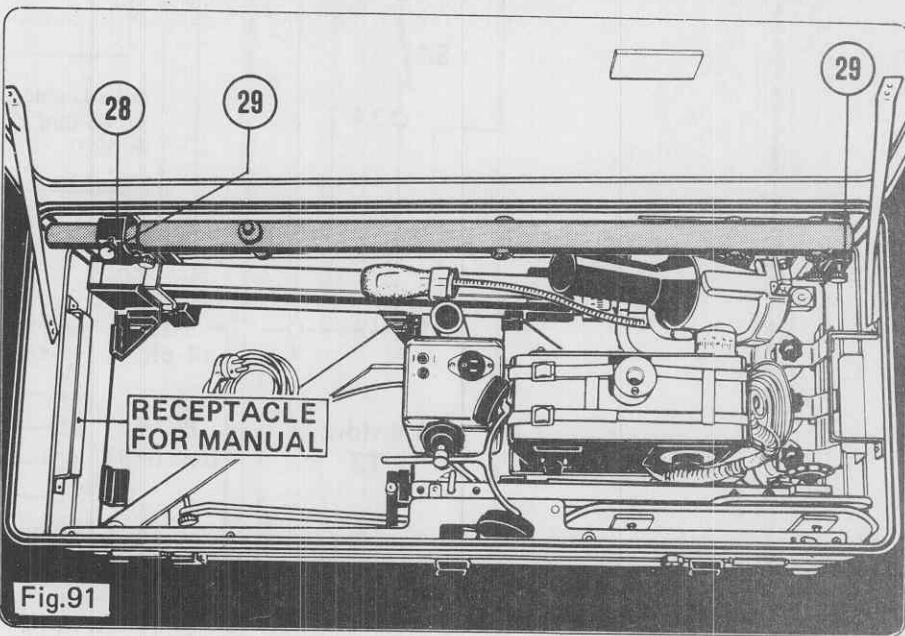
## 5

Raise brackets (24) and (26) OPEN, place scissor arm with X-Ray head into cradle. Secure brackets with fasteners (25) and (27) CLOSE.

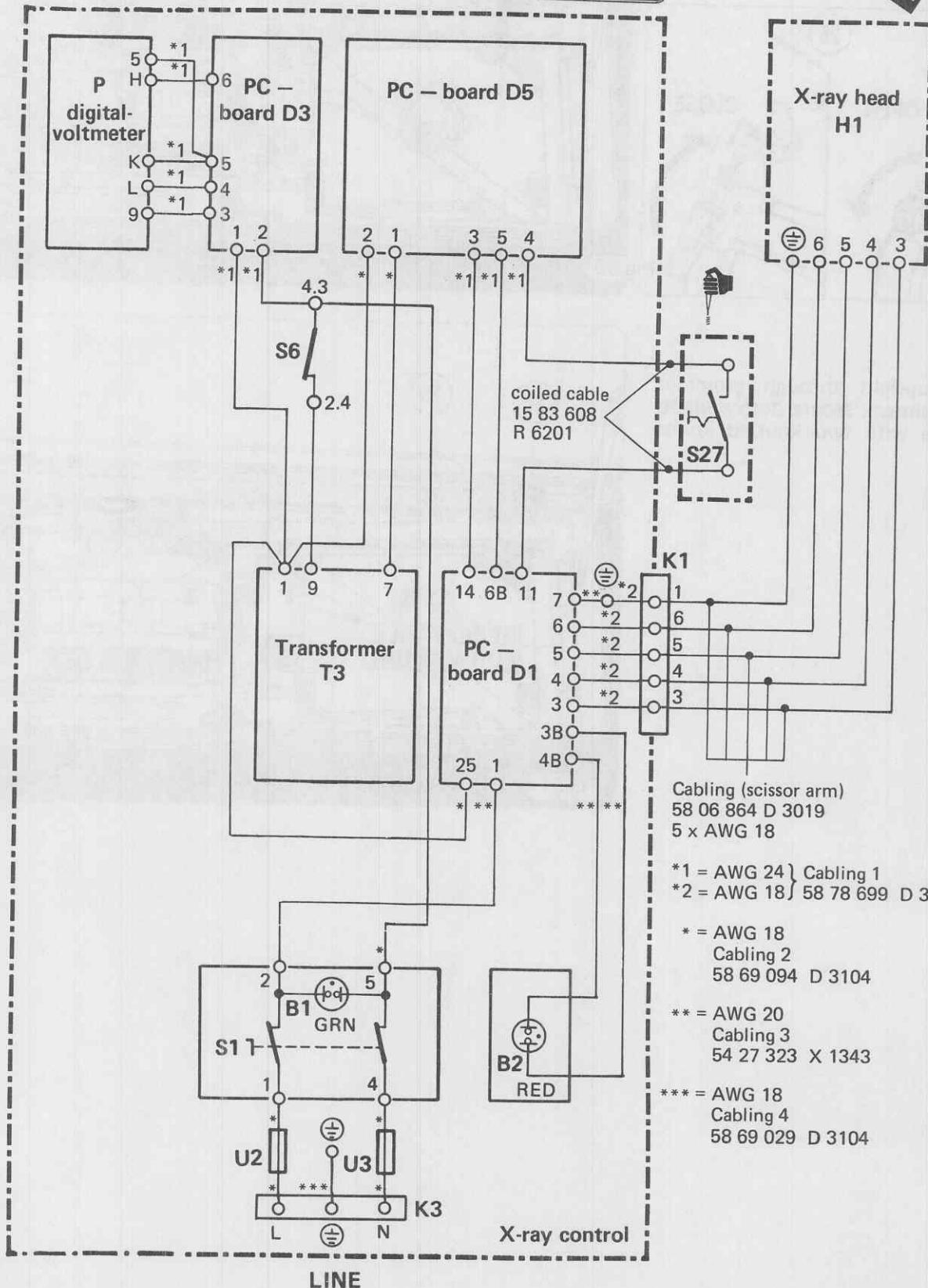


## 6

Guide upright through grommet (28) as shown, secure both ends to the case with two knurled knobs (29).



CABLING DIAGRAM



DHHS – STATEMENTS and INFORMATION according to 21 CFR Sub Chapter J

#### **HELIODENT 70 single-tank dental x-ray generator**

**1020.30 (h) (1) (i)**

**Instructions for the use of the HELIODENT 70 and precautionary statements are part of the OPERATING INSTRUCTIONS:**

**1020.30 (h) (1) (ii)**

After a period of 12 months the X-ray control must be serviced to keep it in compliance with the DHHS Performance Standard.

**See: MAINTENANCE INSTRUCTIONS and/or STORAGE INSPECTION PROCEDURE**

**Note:**

**It is the responsibility of the user to insure that the equipment is maintained in compliance with the manufacturer's recommended Maintenance Schedule.**

Failure of the user to do so relieves the manufacturer or his agents, from all responsibility in this matter.

1020.30 (h) (2) (i)

Rated maximum peak tube potential  
leakage technique factors  
(0,12 mA is the equivalent maximum  
rated continuous tube current for  
7 mA with a duty cycle 1 : 60) 70 kV  
70 kV/0,12 DCmA

Minimum filtration in useful beam 2.7 mm Al at 70 kV

1020.30 (h) (2) (ii)

Cooling curve for the tube housing page 27  
Anode cooling characteristic page 29

**1020.30 (h) (2) (iii)**

The tube is designed for self-rectifying mode of operation with the HELIODENT only.

Nominal tube current (fixed) 7 DCmA  
 Nominal peak tube potential (fixed) 70 kV  
 Duty cycle 1 : 60 in seconds

1020.30 (h) (3) (i)

	60 HZ	50 HZ
Rated nominal line voltage	125 V 230 V	125 V 230 V
Permissible maximum line-voltage regulation at terminal strip K3	6 V	6 V
Line voltage range	109-133 V 207-242 V	109-132 V 207-240 V
Maximum line current at the nominal values of 70 kV and 7 DCmA	125V: 9.5A 230V: 5.0A	17.0A 9.0A
1020.30 (h) (3) (v)		
Generator duty cycle at the nominal values of 70 kV/ 7 DCmA	1 : 60 in sec.	1 : 60 in sec.
Rest minimum 20 sec. between two exposures		
1020.30 (h) (3) (vi)		
Maximum deviation from indicated values		
a. peak tube potential nominal 70 kV	+ 10 kV - 9 kV	+10kV - 9kV
b. tube current nominal 7 DCmA	+ 1,2 DCmA - 2,0 DCmA	+ 1,0 DCmA - 2,5 DCmA
c. exposure time see table		

1020.30 (b) (vii)

Measurement base of technique factors:

- a. kV measurements have been obtained employing the following methods:  
Oscilloscope with frequency compensated bleeder resistors and a spectrum analyzer.
- b. Tube current is measured by a DCmA-meter, accuracy 1,5 % at full scale.
- c. The exposure time is measured with an oscilloscope, and is determined by the time of high - voltage without the pre - heat time.

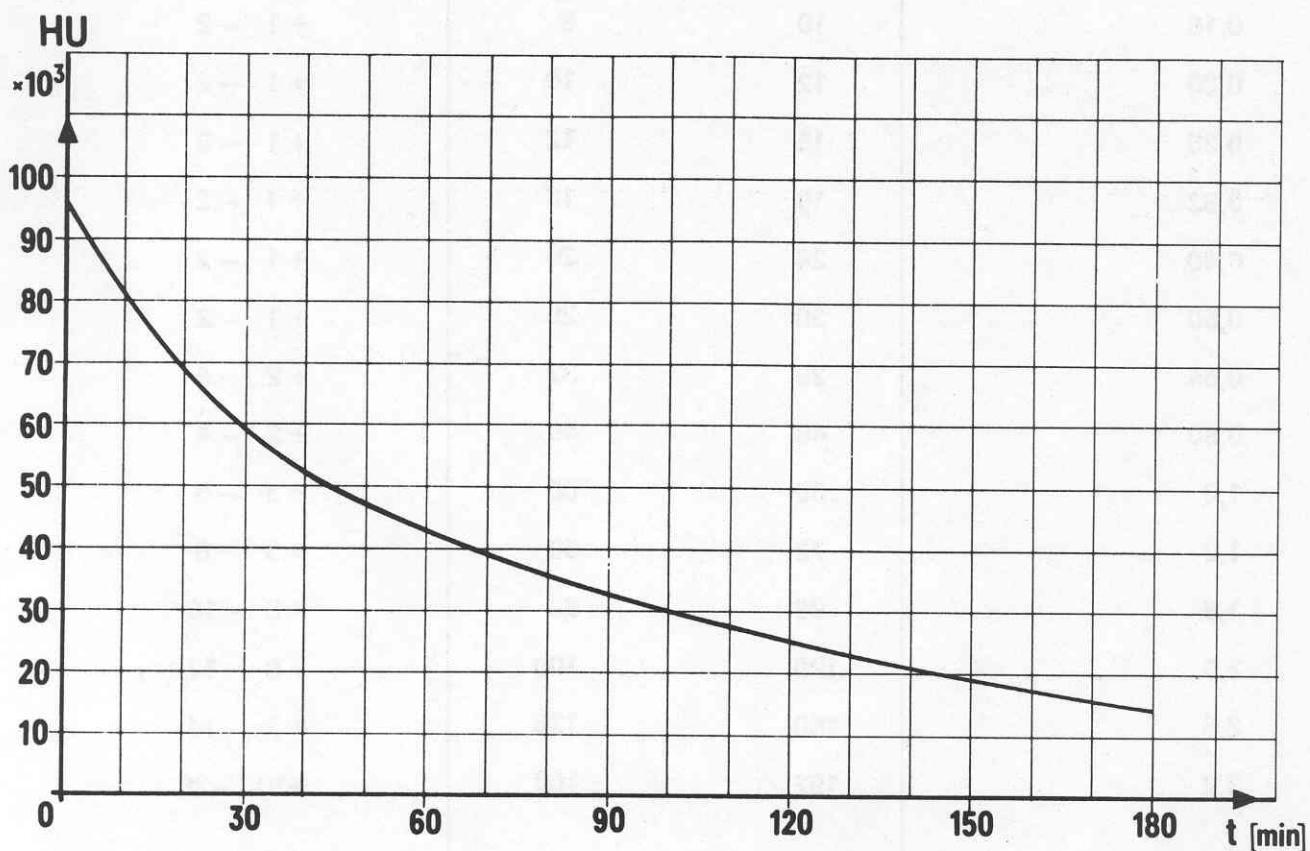
**NOMINAL**

Exposure time: (DENTOTIME)

**MAXIMUM  
DEVIATION**

Exposure time setting (in seconds)	Equivalent pulses		Accuracy of time setting (in pulses)
	60 HZ	50 HZ	
0,066	4	3	+ 1 - 2
0,083	5	4	+ 1 - 2
0,10	6	5	+ 1 - 2
0,13	8	6	+ 1 - 2
0,16	10	8	+ 1 - 2
0,20	12	10	+ 1 - 2
0,25	15	12	+ 1 - 2
0,32	19	16	+ 1 - 2
0,40	24	20	+ 1 - 2
0,50	30	25	+ 1 - 2
0,64	38	32	+ 2 - 4
0,80	48	40	+ 2 - 4
1,0	60	50	+ 3 - 6
1,2	72	60	+ 3 - 6
1,6	96	80	+ 5 - 10
2,0	120	100	+ 6 - 12
2,5	150	125	+ 7 - 14
3,2	192	160	+10 -20

**Cooling curve for the tube housing**

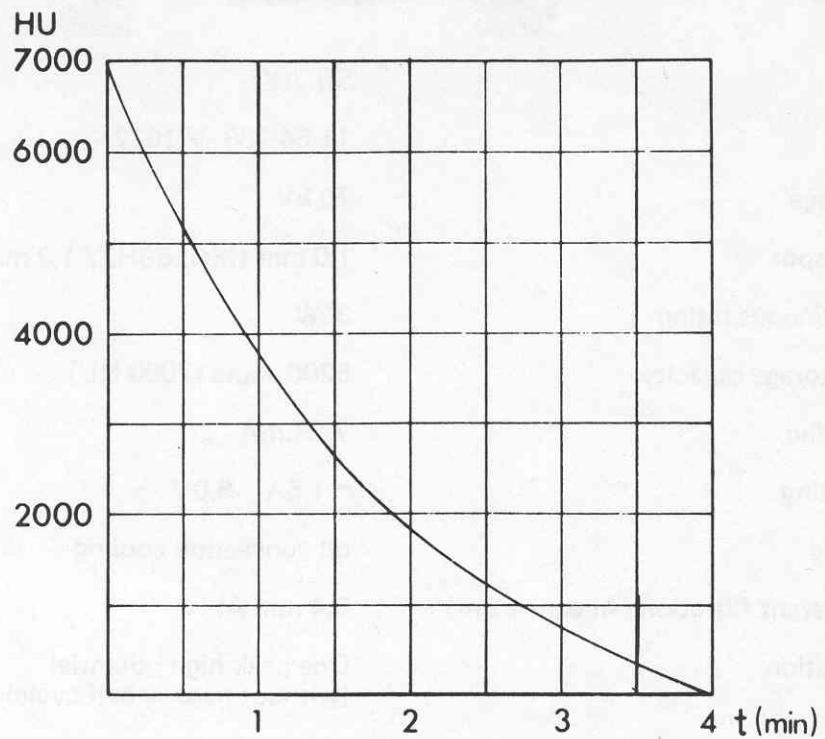


## **Fixed anode tube for single-tank generators**

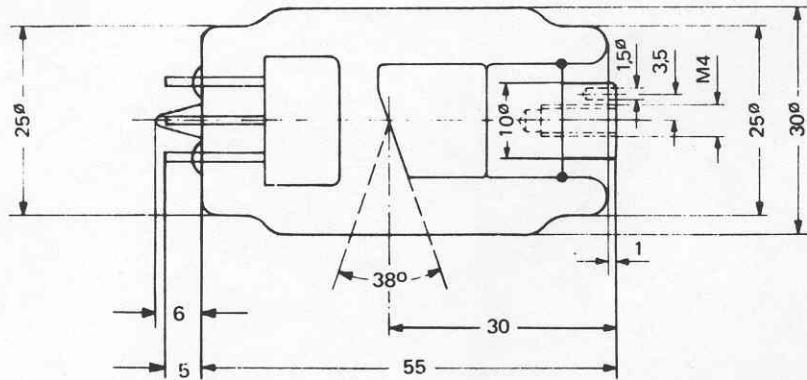
### **Technical data**

Type	SR 70/7
List number	11 54 269 V 1022
Nominal voltage	70 kV
Optical focal spot	1,0 mm (IEC) 60HZ / 1,3 mm (IEC) 50HZ
Nominal continuous rating	30W
Anode heat storage capacity	5200 Joule (7000 HU)
Maximum rating	7 DCmA
Filament heating	~1,5A 5,0V
Anode cooling	oil convection cooling
Minimum inherent filtration (Al equivalent)	0,4 mm Al
Type of operation	One peak high potential (without negativ half cycle) approx. 2 ozs.
Weight	
Application	dental radiographs

Anode cooling characteristic



Dimensions in mm



We reserve the right to make any alterations

**SIEMENS**

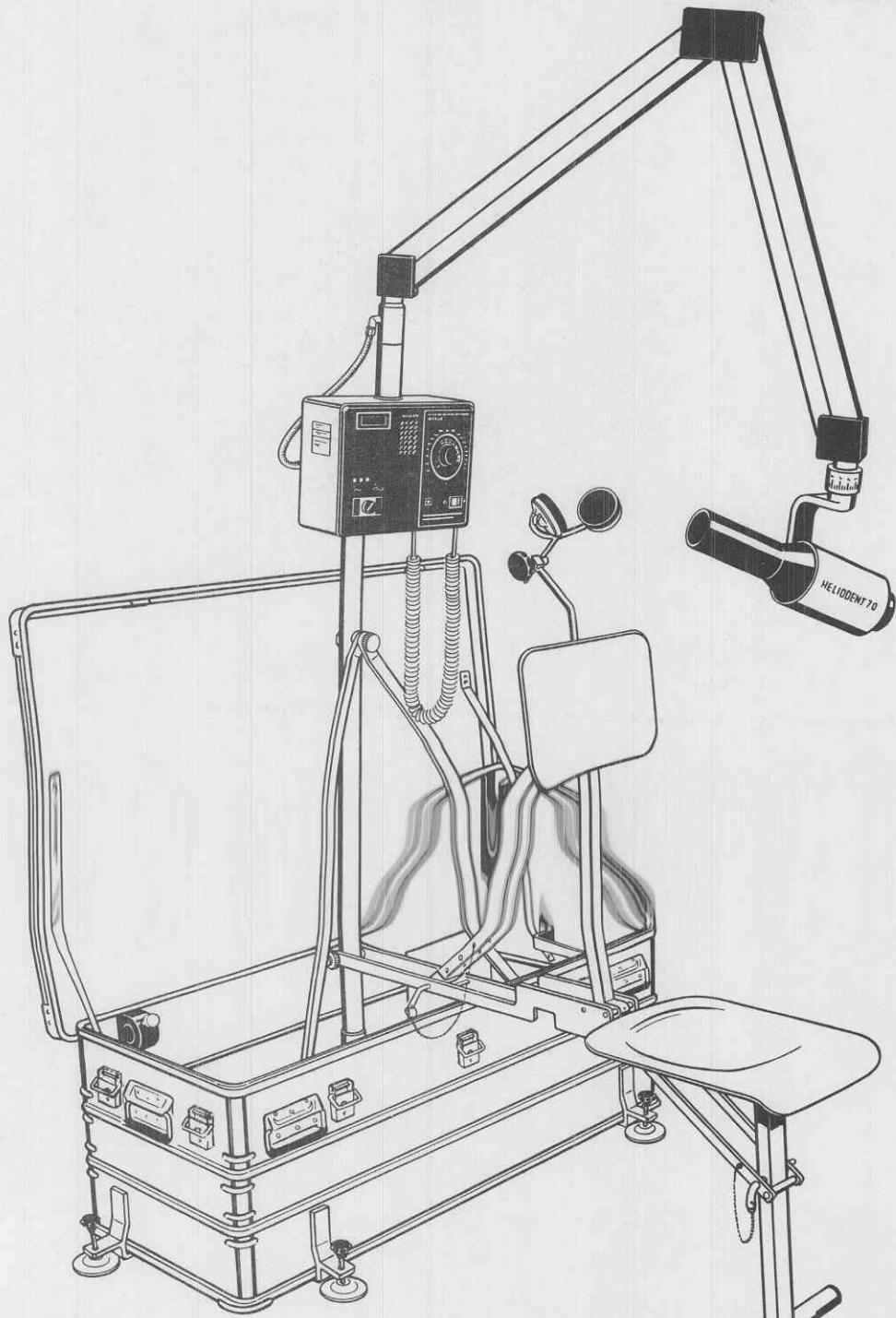
# •PORTARAY

**HELIODENT® 70**

with DENTOTIME

Model D3152 50/60 HZ Operation

List of spare parts

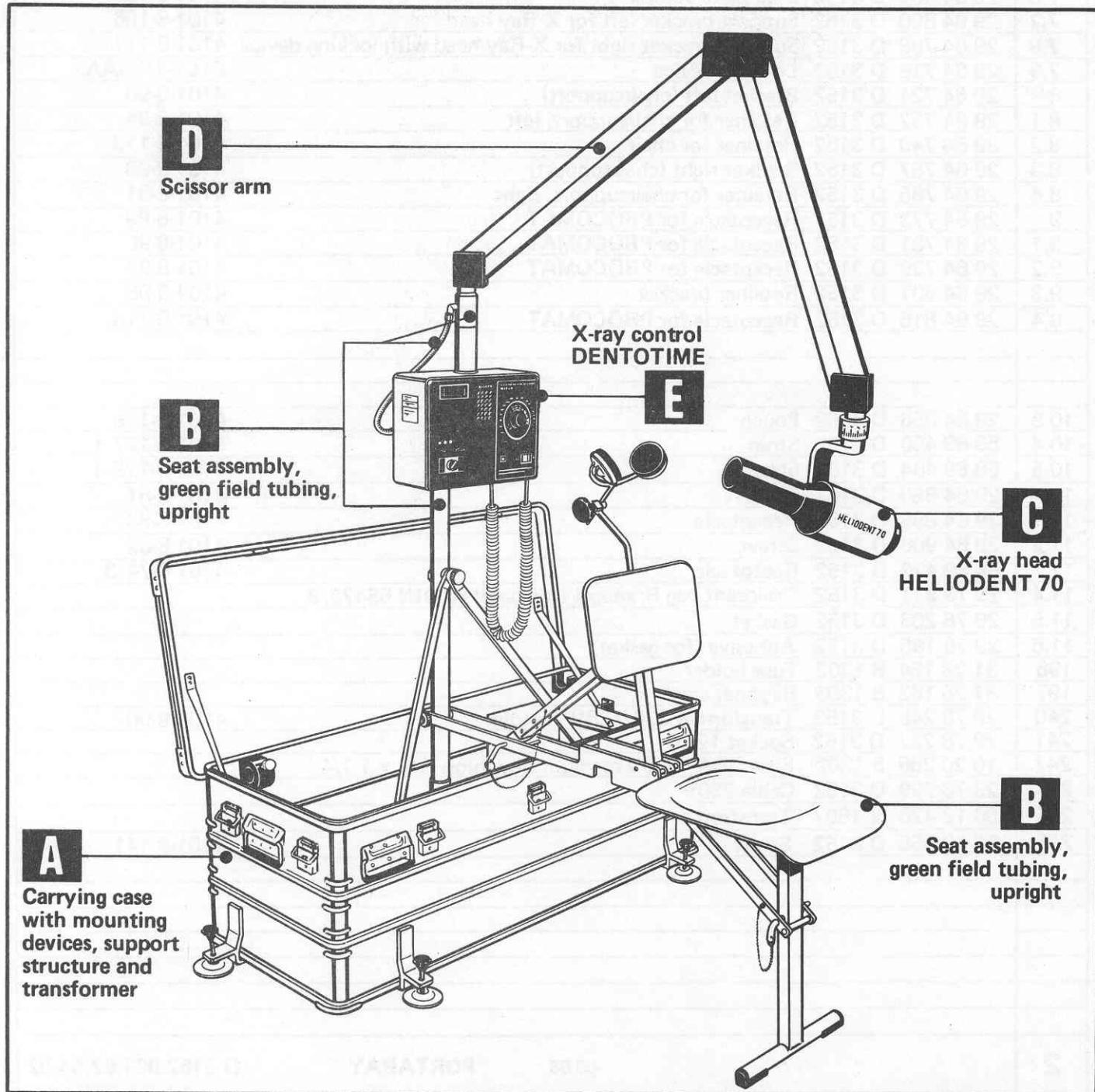


## For information

All the components shown in an assembly drawing, which are available as spare parts, have an item number. Under this item number, you will find the article number (= order number) as well as the designation of the article in the opposite piece liste.

Unit parts shown, whose item numbers are indicated in a circle, are a combination of two or several single parts.

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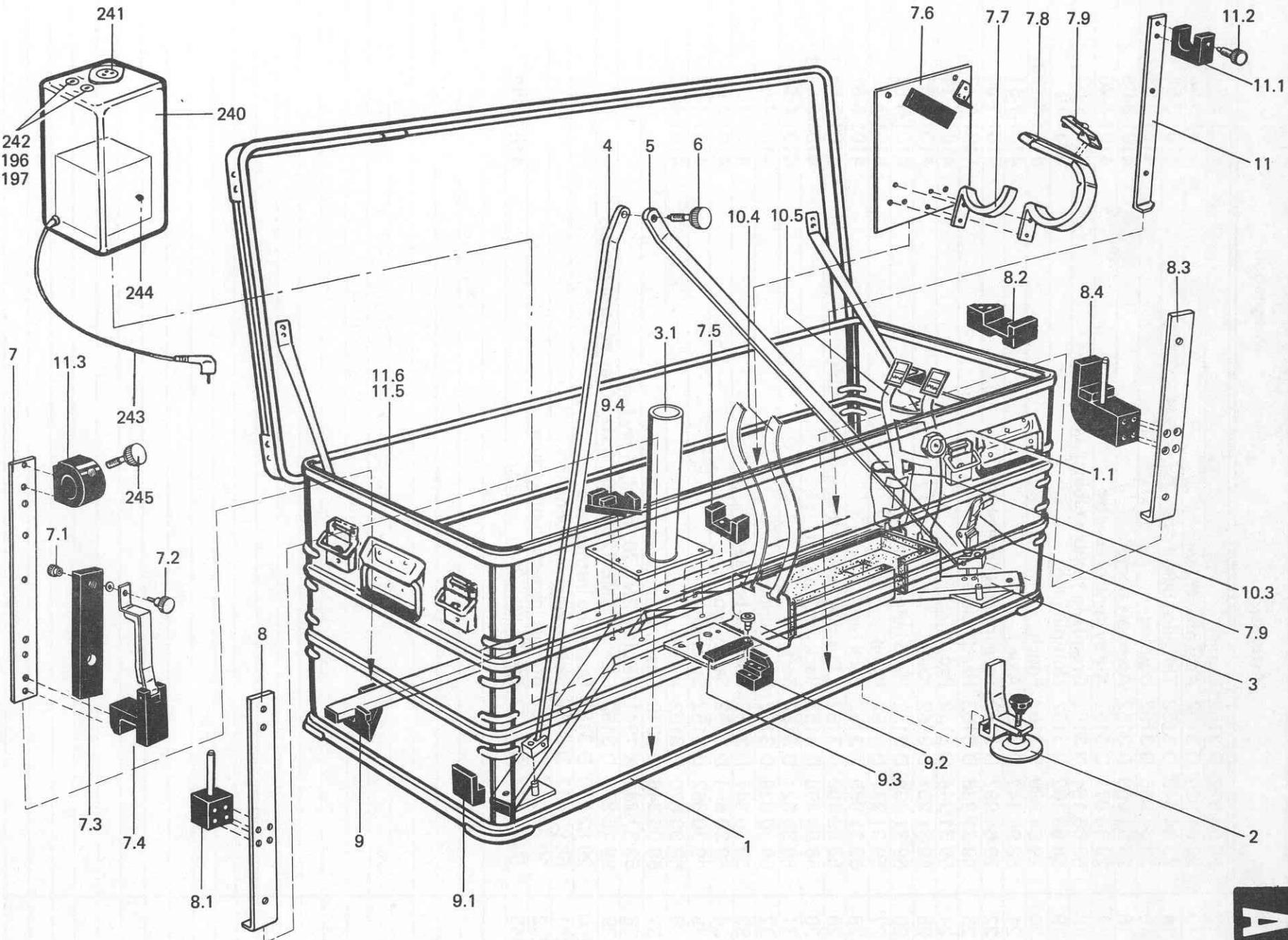
Pos.	Art.-Nr.	Designation
1	58 89 431 D 3152	Case
1.1	29 64 559 D 3152	Pressure relief valve
2	29 64 567 D 3152	Leveling bracket compl.
3	58 89 449 D 3152	Subframe compl.
3.1	29 64 583 D 3152	Upright support bracket
4	29 64 591 D 3152	Support left
5	29 64 609 D 3152	Support right
6	29 64 617 D 3152	Stud with knurled knop
7	29 64 625 D 3152	Bracket left (X-Ray arm)
7.1	29 64 633 D 3152	Threaded bushing
7.2	29 64 641 D 3152	Screw
7.3	29 64 658 D 3152	Rail
7.4	29 64 666 D 3152	Bracket
7.5	29 64 674 D 3152	Receptacle for scissor arm
7.6	29 64 682 D 3152	Base plate compl.
7.7	29 64 690 D 3152	Support bracket left for X-Ray head
7.8	29 64 708 D 3152	Support bracket right for X-Ray head with locking device
7.9	29 64 716 D 3152	Locking device
8	29 64 724 D 3152	Bracket left (chairsupport)
8.1	29 64 732 D 3152	Retainer for chairsupport, left
8.2	29 64 740 D 3152	Retainer for chair
8.3	29 64 757 D 3152	Bracket right (chairsupport)
8.4	29 64 765 D 3152	Retainer for chairsupport, right
9	29 64 773 D 3152	Receptacle for PROCOMAT
9.1	29 64 781 D 3152	Receptacle for PROCOMAT
9.2	29 64 799 D 3152	Receptacle for PROCOMAT
9.3	29 64 807 D 3152	Retainer bracket
9.4	29 64 815 D 3152	Receptacle for PROCOMAT
10.3	29 64 856 D 3152	Pouch
10.4	58 89 456 D 3152	Strap
10.5	58 89 464 D 3152	Strap
11	29 64 880 D 3152	Bracket
11.1	29 64 898 D 3152	Receptacle
11.2	29 64 906 D 3152	Screw
11.3	58 89 472 D 3152	Receptacle
11.4	29 78 211 D 3152	Desiccant bag Branogel (ten bags) 16 DIN 55473/B
11.5	29 78 203 D 3152	Gasket
11.6	29 78 195 D 3152	Adhesive (for gasket)
196	31 28 154 B 1303	Fuse holder
197	31 28 162 B 1303	Bayonet catch
240	29 78 245 D 3152	Transformer 230/125V complete
241	29 78 237 D 3152	Socket 125V
242	10 20 288 B 1302	Fuse 10A 250V medium slow blow 1/4 x 1 1/4 "
243	29 78 229 D 3152	Cable 230V
244	86 12 426 X 1807	Transformer
245	58 59 555 D 3152	Screw
2	06.86	PORTARAY
		D 3152.081.02.04.02

D 3152.081.02.04.02

PORTRAY

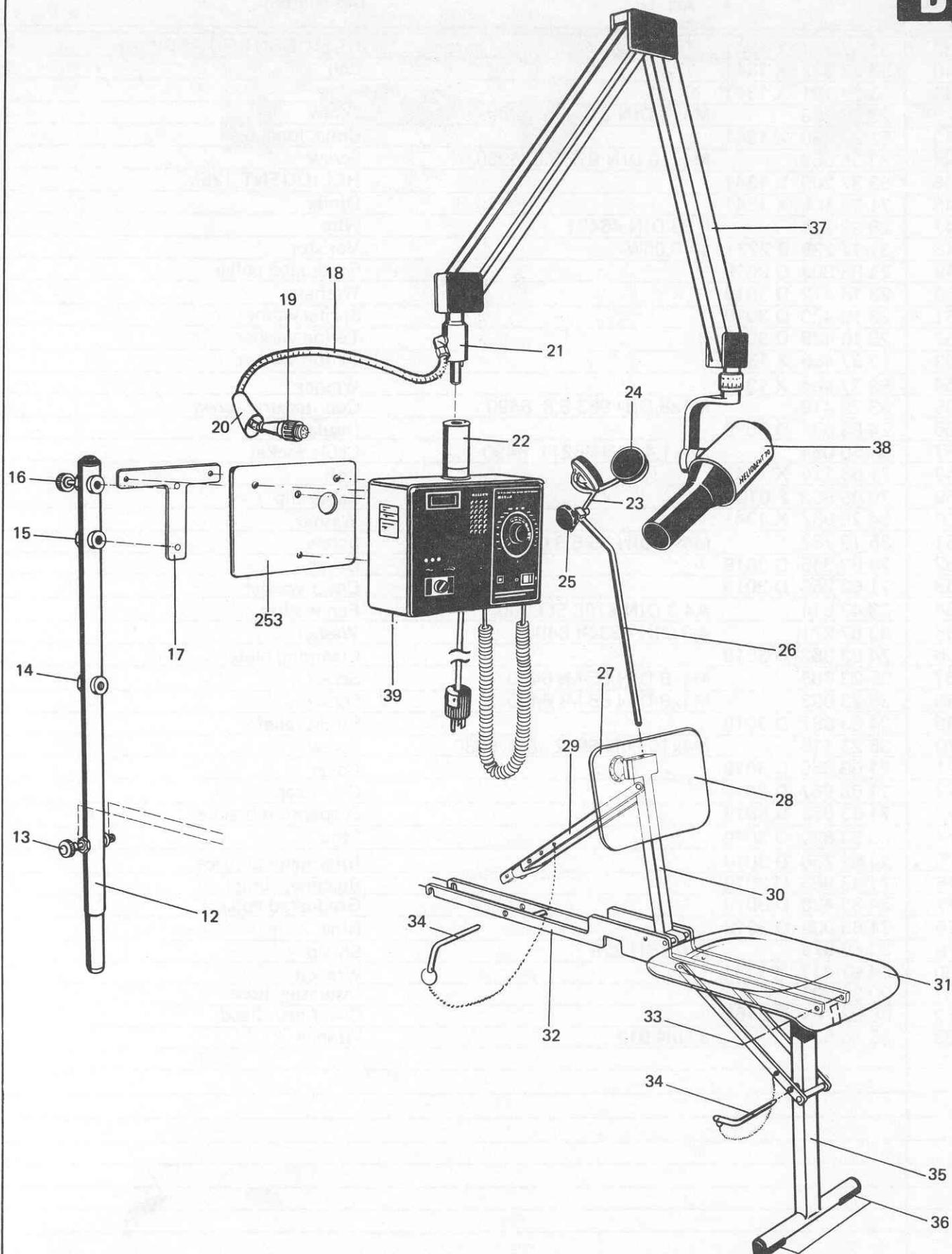
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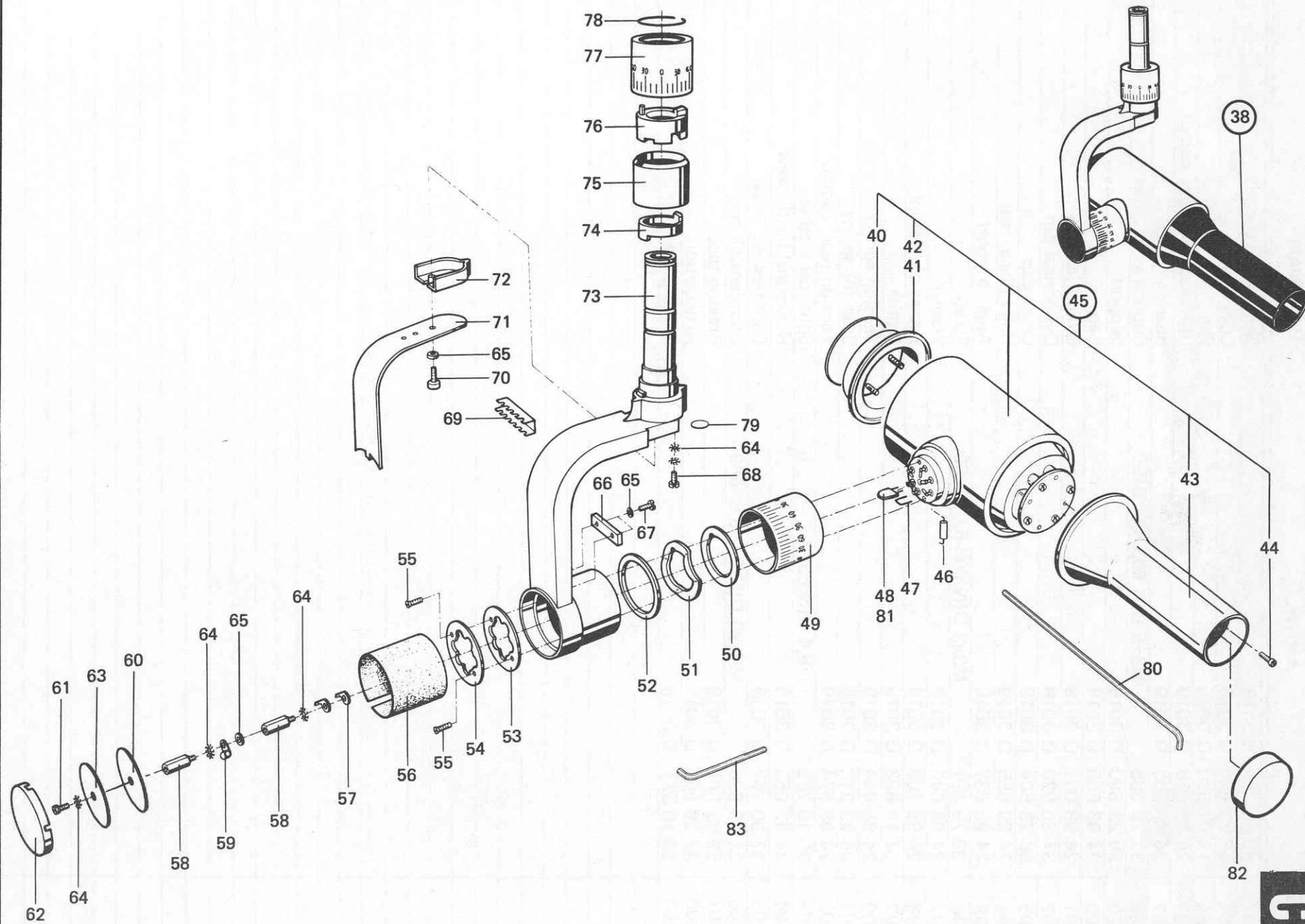


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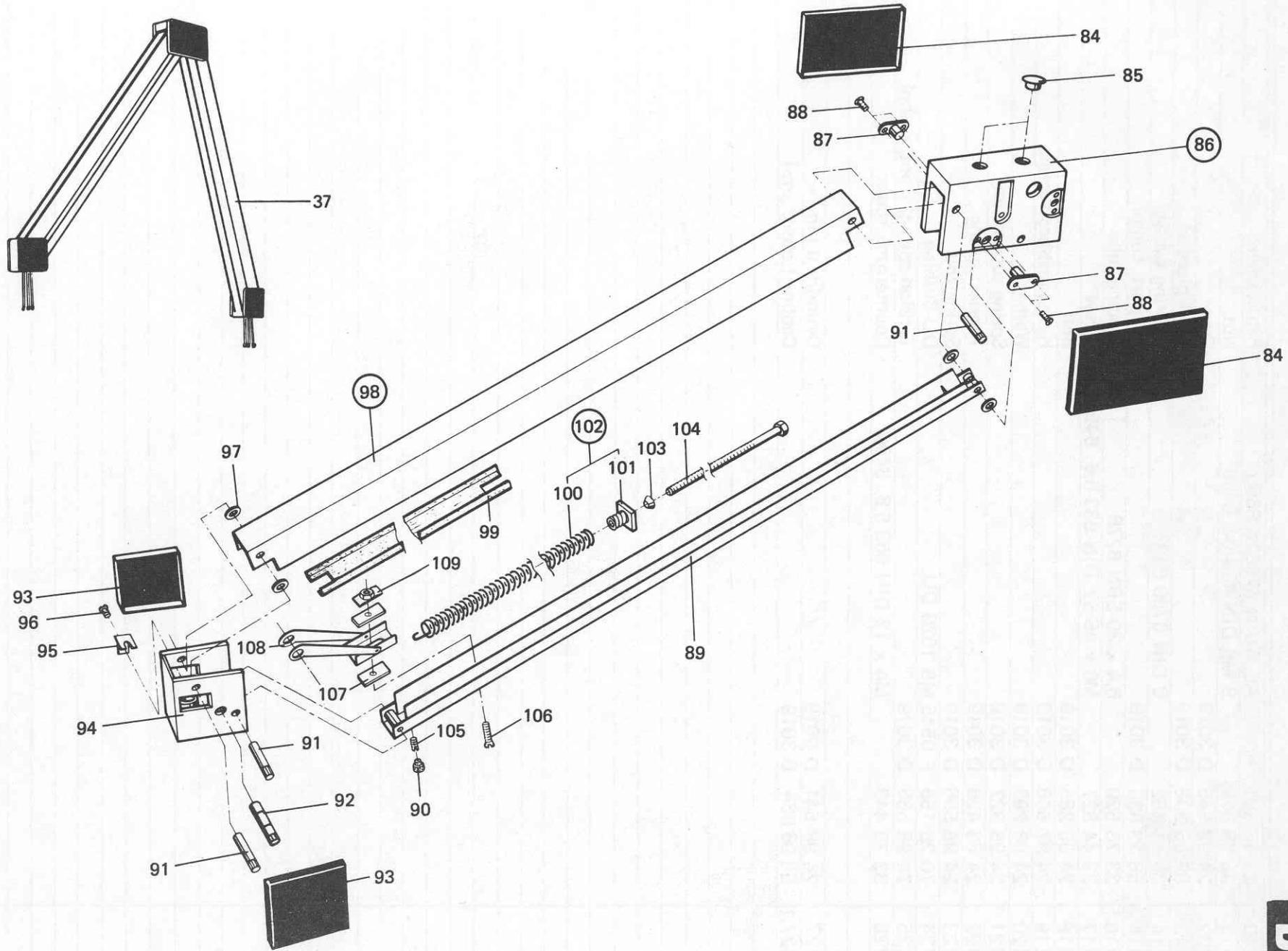
Pos.	Art.-Nr.	Designation
12	29 64 922 D 3152	Upright
13	29 64 930 D 3152	Assembly compl.
14	29 64 948 D 3152	Threaded bushing
15	29 64 955 D 3152	Bushing
16	29 64 963 D 3152	Assembly compl.
17	29 64 971 D 3152	X-Ray control adapter
18	58 96 154 D 3152	Greenfield flexible tubing
19	58 96 162 D 3152	Multipin plug
20	29 64 989 D 3152	Pouch
21	58 96 147 D 3152	Axle
22	29 64 997 D 3152	Axle intermediate piece
23	59 31 936 D 3152	Head holder
24	59 31 944 D 3152	Pad
25	59 31 951 D 3152	Knob
26	59 31 969 D 3152	Head holder bar
27	59 31 977 D 3152	Knob
28	59 31 985 D 3152	Back rest
29	58 89 480 D 3152	3 Position-back rest support assembly
30	58 89 498 D 3152	Back rest support
31	59 30 821 D 3152	Seat
32	59 30 839 D 3152	Chair support bar
33	59 30 847 D 3152	Retainer bracket
34	59 30 854 D 3152	Safety pin
35	59 30 862 D 3152	Stool leg
36	59 30 870 D 3152	Inserts
37	58 05 346 D 3019	Scissor arm compl.
38	53 37 241 X 1341	HELIODENT 70, 125V, X-ray head
39	58 75 885 D 3152	DENTOTIME 125V, 50/60 Hz, X-ray control compl.
250	29 82 239 D 3152	Operating instructions
251	58 92 617 D 3152	Maintenance instructions
252	29 82 213 D 3152	Storage inspection procedure
253	58 89 514 D 3152	Plate
		4101-3-32



Pos.	Art.-Nr.	Designation
38	53 37 241 X 1341	HELIODENT 70,125V
40	53 37 332 X 1341	Cap
41	53 37 191 X 1341	Ring
42	33 32 798 M4x8 DIN 912-8.8 6980	Screw
43	53 37 480 X 1341	Cone, long, lead
44	33 35 569 M4x10 DIN 912-8.8 6980	Screw
45	53 37 209 X 1341	HELIODENT 125V
46	71 63 108 X 1341	Diode
47	20 32 274 0,25 DIN 46431	Wire
48	31 17 298 B 2221 14 0,05W	Varistor
49	24 83 303 D 3019	Graduated collar
50	23 16 412 D 3019	Washer
51	23 16 420 D 3019	Spring washer
52	23 16 438 D 3019	Teflon washer
53	53 37 456 X 1341	Teflon washer
54	53 37 464 X 1341	Washer
55	33 79 419 M4x8 DIN 963-5.8 6490	Countersunk screw
56	24 83 634 D 3019	Insulation
57	33 60 054 A4x1,4 DIN 46211 6490	Cable socket
58	71 63 124 X 1341	Bolt
59	70 05 853 F 0104	Cable clip
60	54 25 962 X 1341	Washer
61	35 19 782 M4x8 DIN 85-5.8 6490	Screw
62	24 83 345 D 3019	Cover
63	71 63 363 D 3019	Cover washer
64	33 43 514 A4,3 DIN 6798-St 6980	Fan washer
65	33 87 271 4,3 DIN 433-St 6490	Washer
66	24 83 352 D 3019	Clamping plate
67	35 23 685 M4x6 DIN 85-Ms 6490	Screw
68	35 23 693 M4x8 DIN 85-Ms 6490	Screw
69	24 83 857 D 3019	Strain relief
70	35 23 115 M4x16 DIN 6912 - 8.8 6980	Screw
71	71 63 355 D 3019	Cover
72	71 63 967 D 3019	Cover cap
73	71 63 959 D 3019	Suspension bracket
74	80 53 829 D 3019	Stop
75	24 83 758 D 3019	Intermediate piece
76	71 63 983 D 3019	Bushing, compl.
77	24 83 428 D 3019	Graduated collar
78	71 63 009 D 3019	Ring
79	33 66 978 220 SRN 825	Shield
80	54 97 417 X 1341	Wrench
81	20 30 591	Insulating hose
82	58 83 194 D 3152	Cover cap (lead)
83	35 35 531 3 DIN 912	Wrench







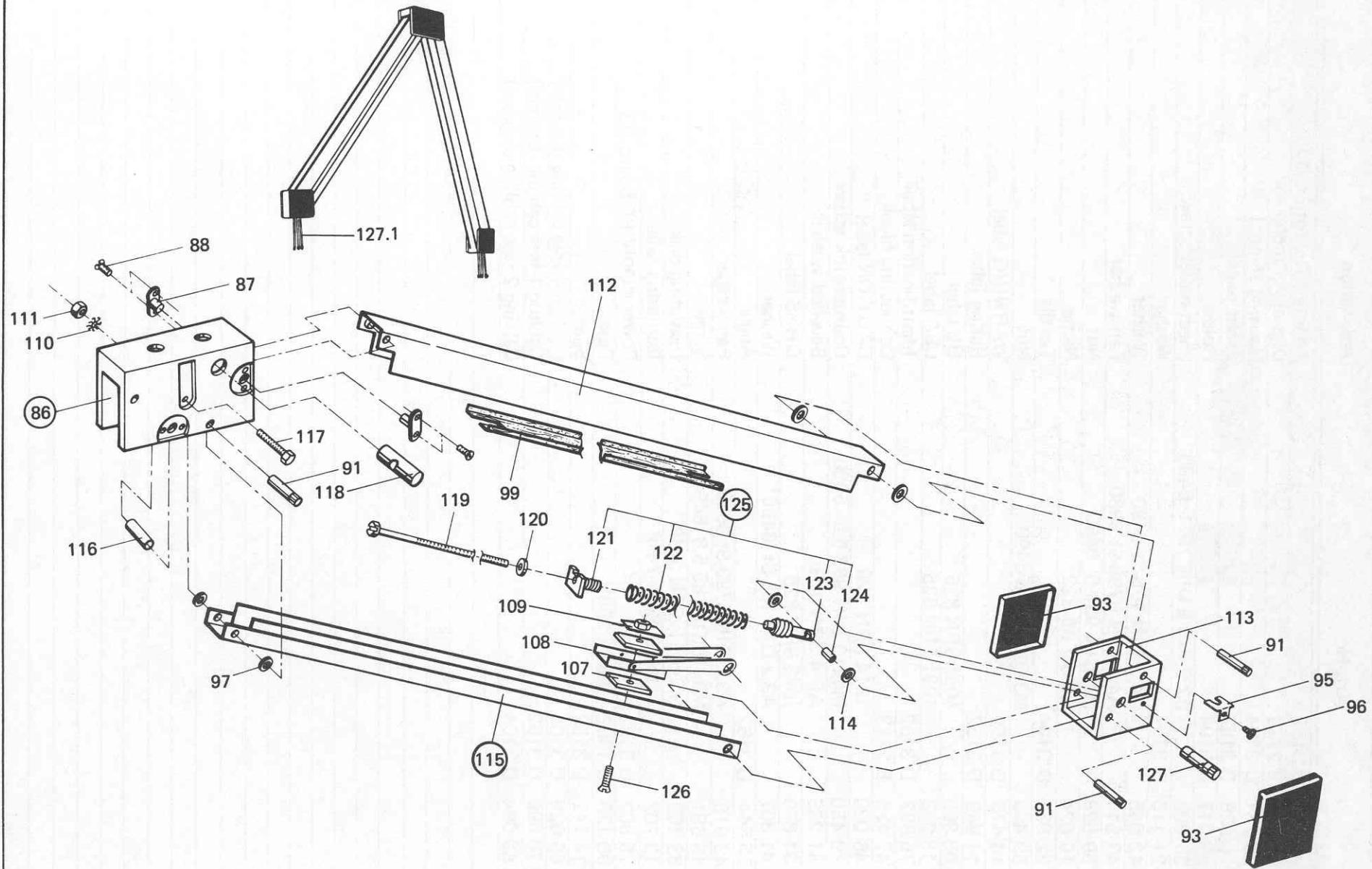
Pos.		Art.-Nr.	Designation
110	33 43 381	A6,4 DIN 6798-St 8650	Fan washer
111	33 58 579	B M6 DIN 439-04 6490	Nut
112	24 98 145 D 3019		Cover
113	58 05 338 D 3019		Head piece
114	35 11 482	8 DIN 6799 6303	Locking washer
115	58 23 638 D 3019		Support, compl.
116	33 73 529	6,4 x 30 SRN 6278	Spacing tube
117	33 44 827	M6 x 45 SZ DIN 933-5.6 6490	Screw
118	24 98 285 D 3019		Bolt
119	24 97 568 D 3019		Hexagonal-head screw
120	24 98 293 D 3019		Washer
121	24 98 327 D 3019		Spring suspension
122	24 83 436 D 3019		Tension spring
123	24 98 558 D 3019		Spring top
124	70 26 156 F 0515 MB 1020 DU		DU-Bushing
125	24 98 566 D 3019		Tension spring, front, compl.
126	33 79 443	M4 x 12 DIN 963-5.8 6490	Countersunk screw
127	24 98 541 D 3019		Cylindrical pin
127.1	58 06 864 D 3019		Cabling (scissor arm)
10		06.86	PORTARAY
			D 3152.081.02.04.02

D 3152.081.02.04.02

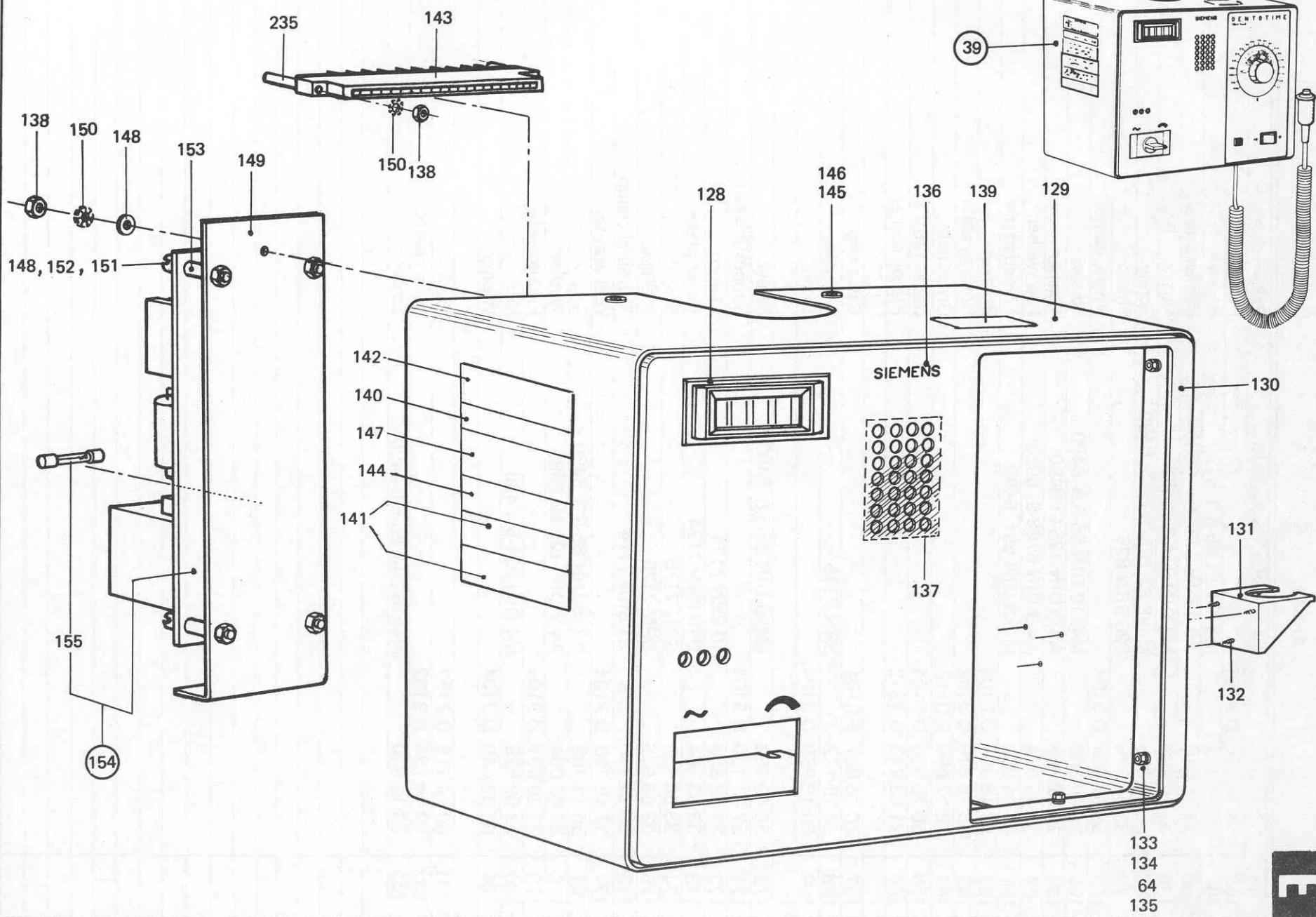
PORTARAY

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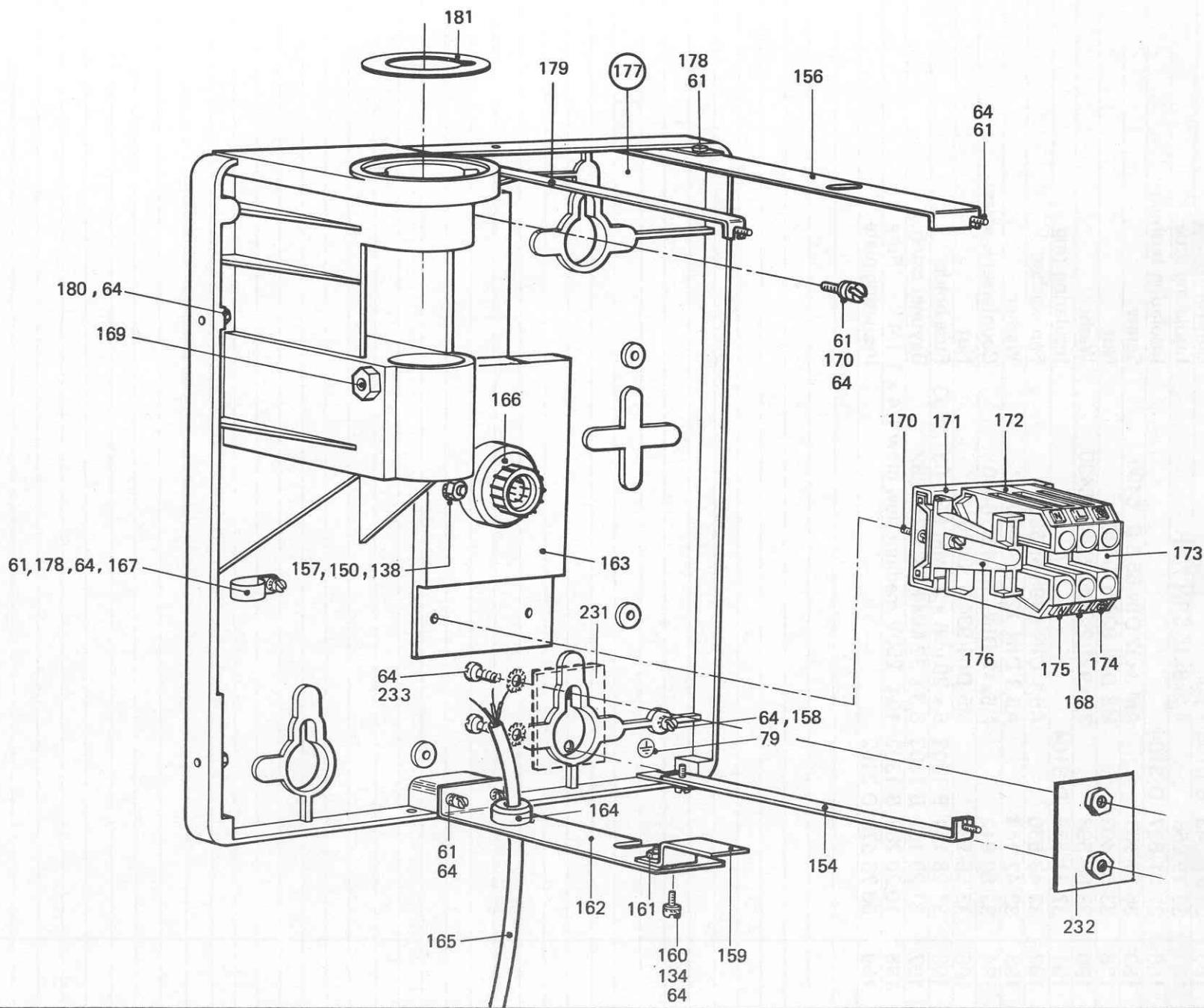
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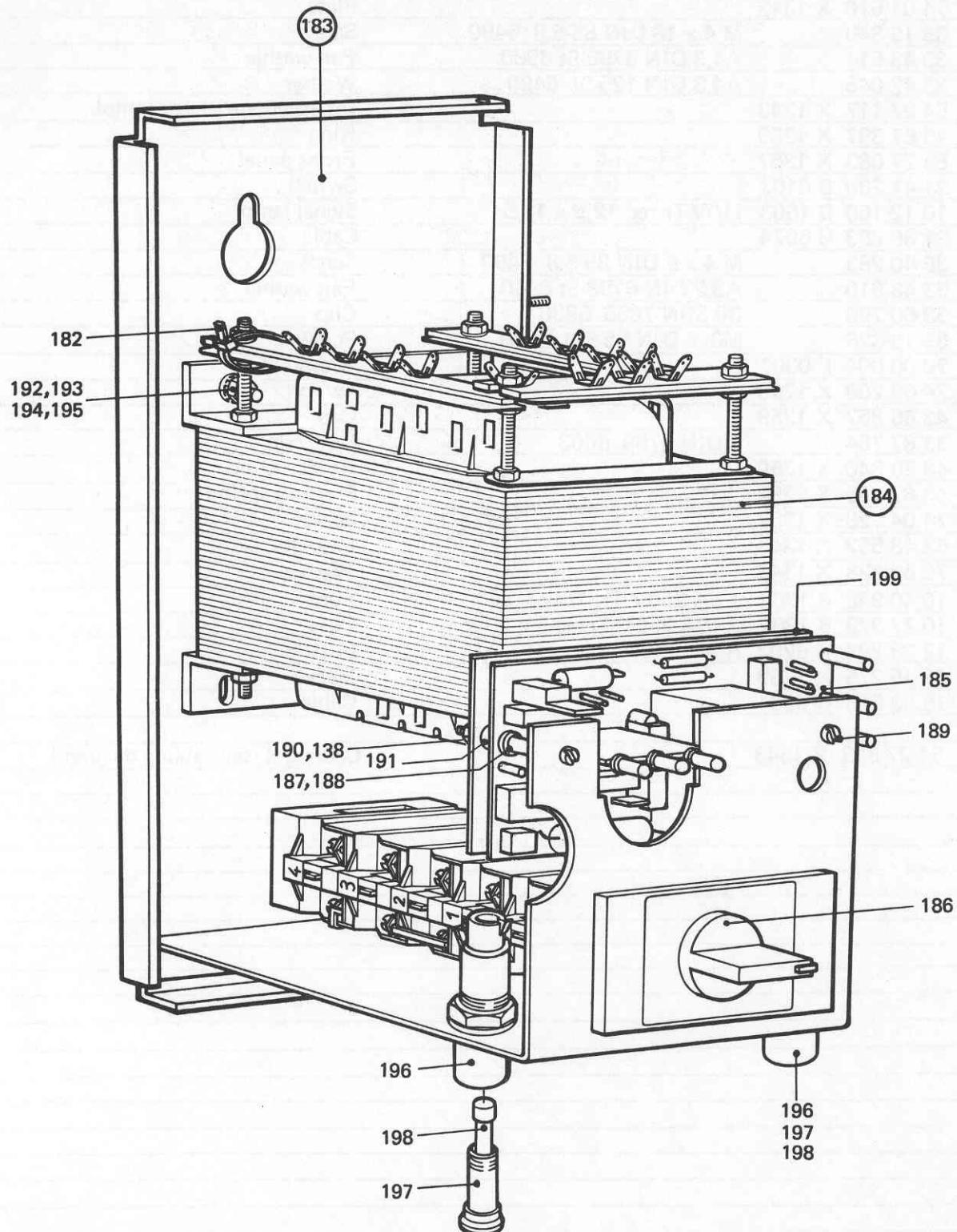
Pos.	Art.-Nr.	Designation
39	58 75 885 D 3152	Adapter, Dentotime 125V
128	31 47 402 B 2713	Digital voltmeter
129	37 23 731 D 3104	Housing , compl.
130	58 75 828 D 3152	Front panel
131	37 28 417 D 3104	Holder
132	33 36 898 BZ 2,9x6,5 DIN 7971 6490	Sheet-metal screw
133	37 21 115 D 3104	Washer
134	33 42 045 A4,3 DIN 125-St 6490	Washer
64	33 43 514 A4,3 DIN 6798-St 6980	Fan washer
135	33 59 528 M4 DIN 934-5 6490	Nut
136	34 10 024 A5 SN 66 322	Name
137	37 22 931 D 3104	Textile
138	33 59 403 M3 DIN 934-5 6490	Nut
139	59 14 478 D 3152	WARNING label
140	59 11 949 D 3152	Rating label
141	34 05 909 1051 SRN 825	UL label
	34 18 993 1091 SRN 825	CSA label
142	58 75 992 D 3152	Identification label
143	31 47 428 B 2713	Connecting block
144	33 46 020 1014 SRN 825	CAUTION label
145	33 79 450 M4x10 DIN 963-5.8 6490	Countersunk screw
146	33 81 233 AF 4 SRN 133	Bevelled washer
147	35 31 878 1043 SRN 825	DHHS label
148	33 41 807 A3,2 DIN 125-St 6490	Washer
149	58 75 844 D 3152	Angle
150	33 43 910 A3,2 DIN 6798-St 6980	Fan washer
151	35 19 691 M3x16 DIN 85-5.8 6490	Screw
152	33 83 189 3,2x8x1 SRN 3-HP	Insulating disk
153	35 13 702 4x8x10 SRN 7-HP	Insulating tube
154	58 75 802 D 3152	Power supply PC board D3
155	10 90 133 B 1302 0,063A 250V	Fuse
235	59 14 742 D 3152	Spacer
236	58 69 029 D 3104	Cabling 4 (see cabling diagram)
237	58 78 699 D 3152	Cabling 1 (see cabling diagram)
238	58 69 094 D 3104	Cabling 2 (see cabling diagram)



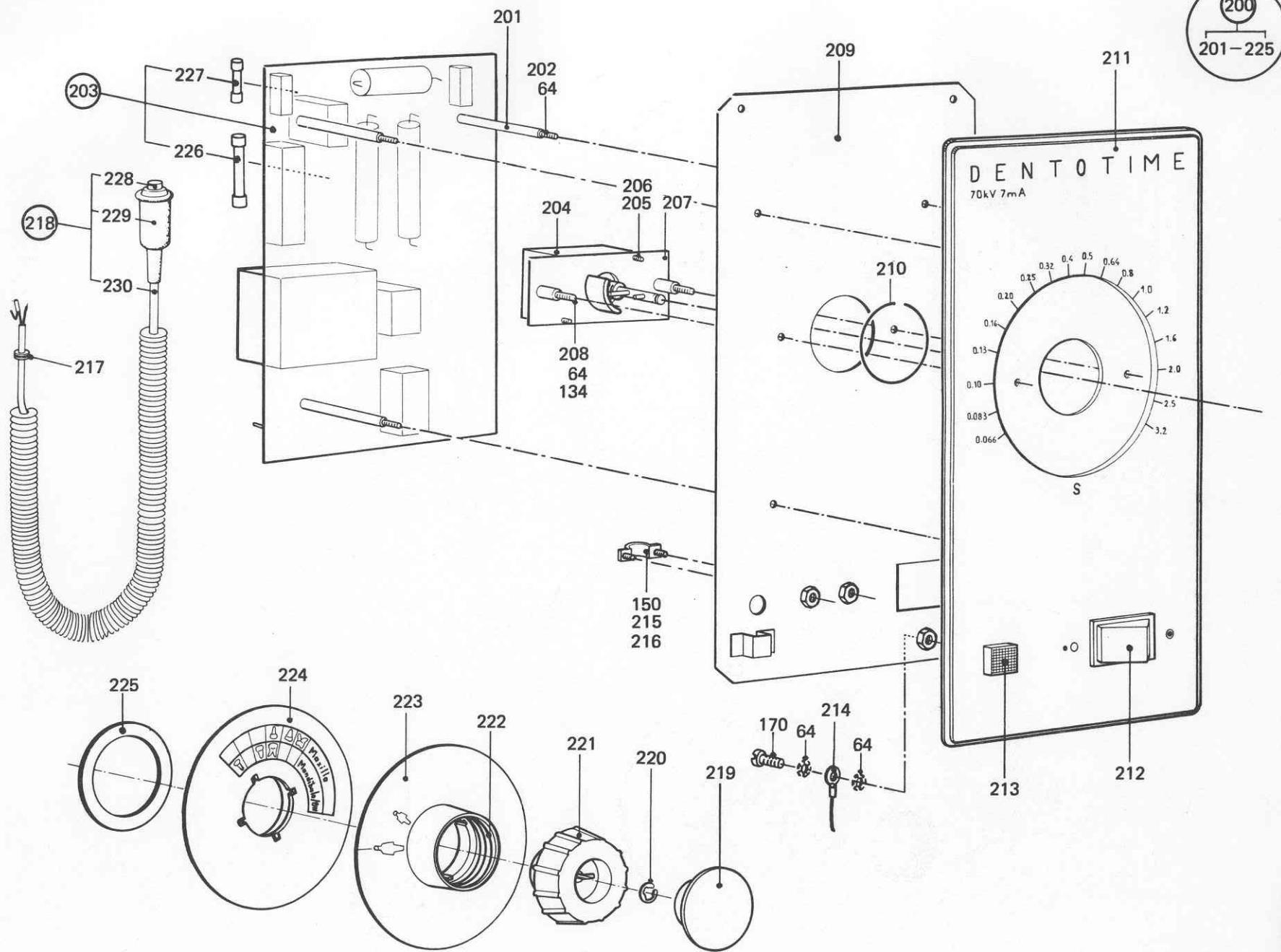
Pos.		Art.-Nr.	Designation
64	33 43 514	A4,3 DIN 6798-St 6980	Fan washer
156	58 66 686 D 3104		Fixing angle
157	35 25 714	M3x8 DIN 85-5.8 6490	Screw
150	33 43 910	A3,2 DIN 6798-St 6980	Fan washer
138	33 59 403	M3 DIN 934-5 6490	Nut
158	35 40 655	M4x8 SZ DIN 933-Ms 6490	Screw
79	33 66 978	220 SRN 825	Shield
159	58 05 064 D 3104		Angle, compl.
160	35 40 309	M4x10 DIN 85-5.8 6490	Screw
134	33 42 045	A4,3 DIN 125-St 6490	Washer
64	33 43 514	A4,3 DIN 6798-St 6980	Fan washer
161	33 44 850	M4x8 DIN 551 6490	Threaded pin
162	58 18 992 D 3104		Bracket
163	58 78 616 D 3152		Holding plate
164	70 17 650 F 0112		Grommet
165	58 75 935 D 3104		Cable 125V
166	21 68 243 Q 1212		Flange socket
167	70 05 887 F 0104		Cable clip
168	34 15 122	SRN 7175	L-Shield
169	58 18 950 D 3104		Brake
170	35 40 283	M4x6 DIN 85-5.8 6490	Screw
171	37 31 130 D 3104		Supporting rail
172	33 53 356	10 SRN 7174	Clamp
173	33 53 364	D10 SRN 7174	Cover plate
174	33 58 843	SRN 7175	Shield
175	33 58 926	SRN 7175	N-Shield
176	33 52 796	E1 SRN 7174	Terminal clamp
177	37 19 788 D 3104		Wall adapter
61	35 19 782	M4x8 DIN 85-5.8 6490	Screw
178	33 42 094	A4,3 DIN 125 Ms 6490	Washer
179	37 20 091 D 3104		Fixing angle
180	33 59 528	M4 DIN 934-5 6490	Nut
181	58 32 449 D 3104		Washer
231	59 14 718 D 3152		Plate
232	59 14 734 D 3152		Plate,compl.
233	35 19 840	M4x16 DIN 85-5.8 6490	Screw
14		06.86	PORTARAY
			D 3152.081.02.04.02







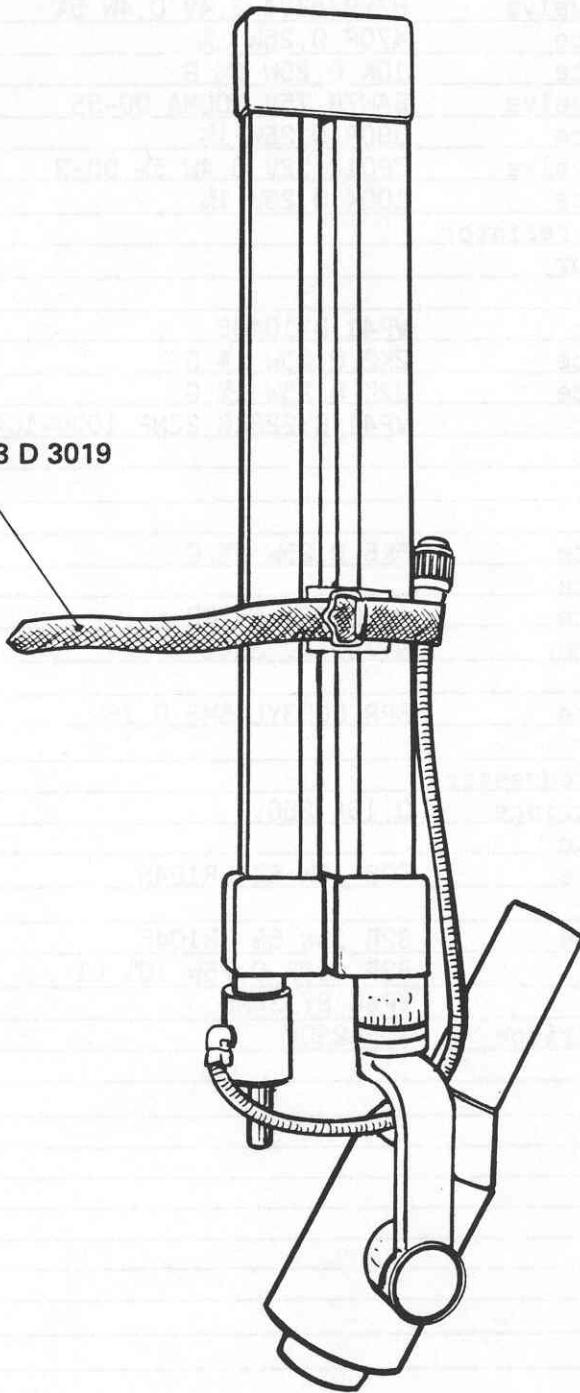
Pos.	Art.-Nr.	Designation
200	84 02 430 X 1357	50/60 Hz
201	33 80 557	4,5 x 35 SRN 6278 6490
202	35 20 491	AM 4 x 40 DIN 85-5.8 6490
203	83 53 245 X 1357	50/60 HZ Operation
204	81 38 265 X 1357	Switch
205	33 87 065	M2,5 x 20 DIN 84-5.8 6490
206	33 85 762	A2,7 DIN 6798-St 6980
207	74 04 510 X 1343	Plate
208	35 19 840	M 4 x 16 DIN 85-5.8 6490
64	33 43 514	A4,3 DIN 6798-St 6980
134	33 42 045	A4,3 DIN 125-St 6490
209	54 27 117 X 1343	Intermediate plate, compl.
210	43 67 397 X 1259	Ring
211	54 27 083 X 1357	Front panel
212	31 41 280 B 0103	Switch
213	10 12 160 B 1603	110V Tr red 12,5 x 12,5
214	21 80 883 G 5074	Cable
170	35 40 283	M 4 x 6 DIN 85-5.8 6490
150	33 43 910	A3,2 DIN 6798-St 6980
215	33 60 799	B6 SRN 7855 6980
216	35 19 626	M3x6 DIN 85-5.8 6490
217	70 00 094 F 0307	Grommet
218	74 69 208 X 1260	Switch
219	43 66 357 X 1259	Cap
220	33 87 784	4 DIN 6799 6603
221	43 66 340 X 1259	Ring clip
222	43 67 405 X 1259	Rotary knob
223	43 67 405 X 1259	Pressure spring
224	74 04 528 X 1357	Scale
224	53 48 552 X 1343	Disk, indicator
225	72 59 328 X 1343	Washer
226	10 40 948 B 1302	1,5A 250V Tr. 1/4x1 1/4"
227	10 77 379 B 1302	0,16A 250V Traeg 5 x 20 mm
228	12 38 294 R 6207	R Sch 207A
229	49 45 275 X 1259	Button
230	15 83 608 R 6201	Sleeve
230	15 83 608 R 6201	Cable
246	54 27 323 X 1343	Cabling 3 (see cabling diagram)



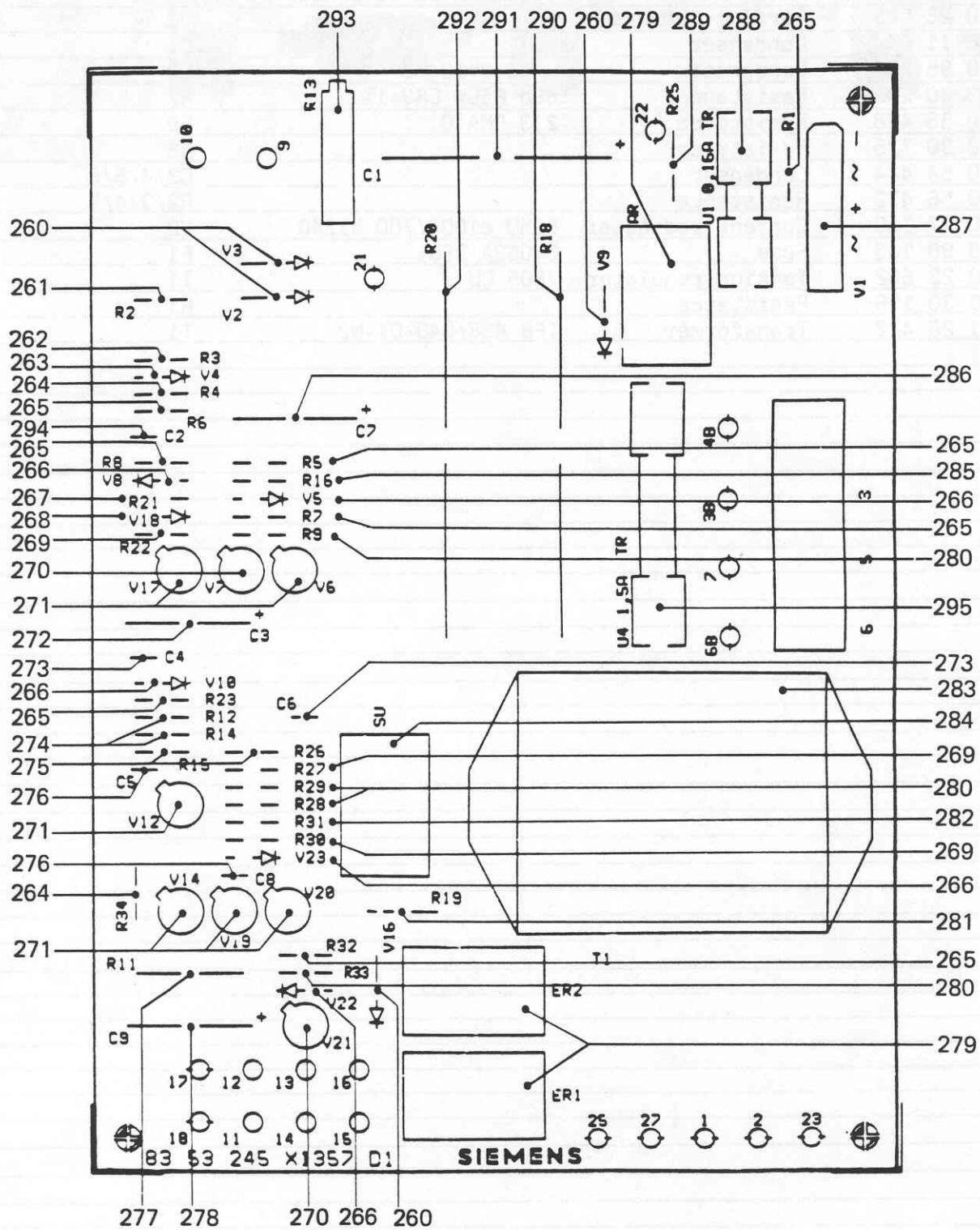
**MAINTENANCE INSTRUCTIONS  
SPARE PART LIST  
SUPPLEMENT  
(FOR GOVT. USE ONLY)**

D

Safety strap  
Order No. 26 56 783 D 3019



Pos.	Art.-Nr.	Designation
203	83 53 245	PC Board D1
260	10 99 258	Diode valve
261	31 17 298	Varistor
262	10 56 332	Resistance
263	10 99 001	Fleming valve
264	10 52 760	Resistance
265	10 36 912	Resistance
266	10 38 009	Fleming valve
267	10 56 324	Resistance
268	10 71 117	Fleming valve
269	10 52 893	Resistance
270	10 74 178	Transfer resistor
271	10 16 823	Transistor
272	10 55 672	Condenser
273	10 95 389	Condenser
274	10 57 108	Resistance
275	10 52 869	Resistance
276	10 81 140	Condenser
277	10 90 430	Conducter
278	10 55 698	Condenser
279	10 98 789	Relay
280	10 49 451	Resistance
281	10 30 345	Resistance
282	10 52 810	Resistance
283	31 12 836	Transformer
284	31 34 442	Relay
285	31 06 697	Resistance
286	10 55 706	Condenser
287	10 23 068	Current redresser
288	10 77 379	Fuse cartridge
289	10 30 287	Resistance
290	31 26 224	Resistance
291	10 11 642	Condenser
292	31 26 398	Resistance
293	10 57 033	Trimmer
294	10 95 397	Condenser
295	10 40 948	Fuse cartridge





PC Board D3

E

